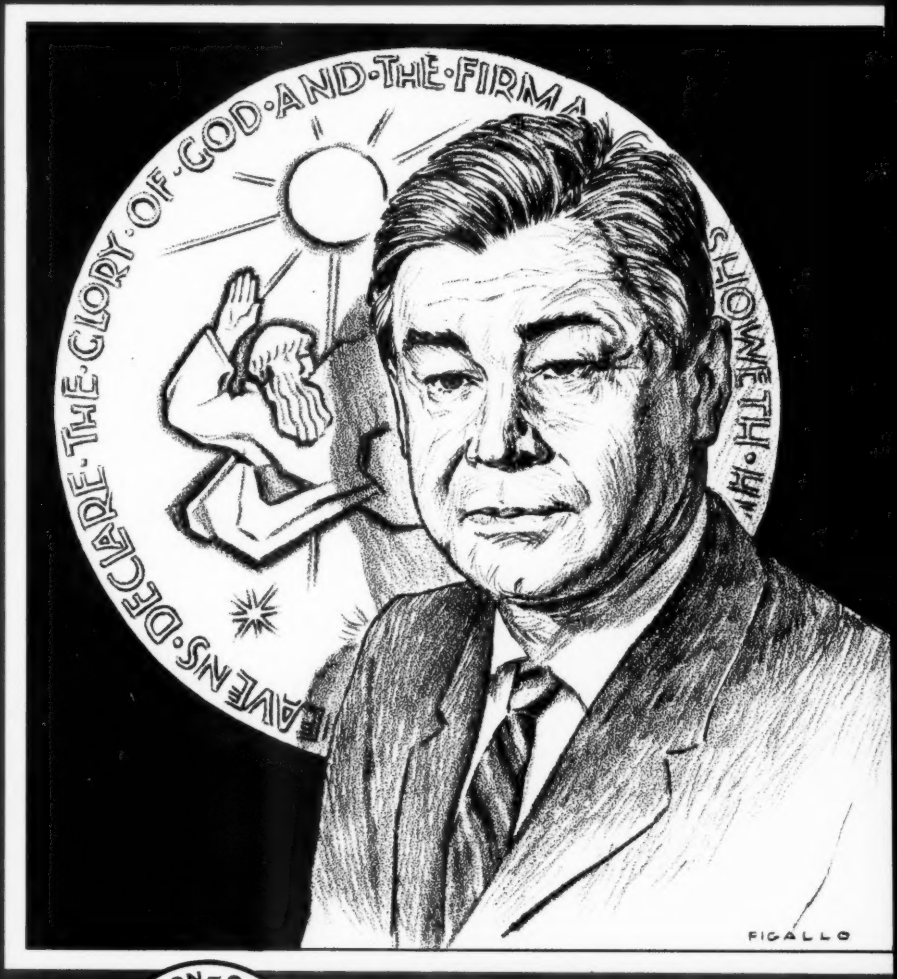
# GeoTimes

Professional News Magazine

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April, 1960

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# Calendar

*Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.*

April 11-13, 1960—AIME: Fifth Ann. Mining, Minerals and Petroleum Conf., Univ. of Alaska, College, Alaska. Principal speakers, Dr. James Boyd, V.P. Kennecott Copper Corp., and Dr. Joseph Gillson, 1960 Pres., AIME. Write: Alaska Sect., AIME, Box 4001, College, Alaska.

April 14-15, 1960—LAKE SUPERIOR INSTITUTE OF GEOLOGY, 6th Ann. Meeting, sponsored jointly by UW dept. of geology and the Wisc. Geol. and Nat. Hist. Survey, Univ. of Wisconsin campus, Madison. Write: E. N. Cameron, Science Hall, Univ. of Wisconsin, Madison.

*April 14-16, 1960—SEPM: Permian Basin Sect., Ann. Meeting, April 14, Abilene, Texas. Field conf. to study Pennsylvanian and L. Permian, April 15, 16. Write: J. P. Brand, Texas Tech. Coll., Lubbock.

April 20-21, 1960—MUSKEG RESEARCH CONFERENCE, 6th Ann. Meeting, sponsored by Assoc. Comm. on Soil and Snow Mechanics of the NRC of Canada, Calgary, Alta. Write: I. C. McFarlane, c/o Div. of Bldg. Research, Nat. Res. Council, Ottawa 2, Canada.

**GEOTIMES CALENDAR**

**Meeting notices for the GeoTimes Calendar should be submitted in concisely edited form to:**

**Mrs. Kathryn Lohman**
**GeoTimes Calendar Editor**
**2101 Constitution Ave., N.W.**
**Washington 25, D.C.**

April 21-22, 1960—AIME: Southwest Metals & Minerals Conf., Ambassador Hotel, Los Angeles, Calif.

*April 21-22, 1960—NEW MEXICO GEOL. SOC., Spring Meeting, April 22, Socorro, N.M. Informal field trips in central N.M. April 23. Write: Society, Campus Station, Socorro, N. Mex.

*April 22-23, 1960—OHIO ACAD. OF SCIENCE, Geol. Sect., meeting, Antioch College, Yellow Springs, Ohio. Field trip Apr. 23.

April 22-23, 1960—AASG: Pennsylvania Geol. Survey, Harrisburg, Pa.

April 24-28, 1960—ACerS: 62nd Annual Meeting, Bellevue-Stratford Hotel, Philadelphia.

April 25-27, 1960—CIM Ann. Mtg., Royal York Hotel, Toronto, Canada.

*April 25-28, 1960—AAPG-SEPM: Ann. Meeting, Chalfonte-Haddon Hall, Atlantic City. Four field trips: N. J. Coastal Plain, Apr. 23-24 ($14); South Mtn., Md., Apr. 23-24 ($37); Carbonate Rocks, Md. & Penna., Apr. 22-24 ($55); Shenandoah Valley, Va., Apr. 22-24 ($67). Write: R. B. Neuman, Rm. 337, U.S. Nat. Museum, Washington 25, D. C. Guidebook.

April 28-30, 1960—AGU: 41st Ann. Meeting, Washington, D. C. This date is tentative.

*April 27-30—GSA: Rocky Mountain Sect. Regional Meeting, School of Mines & Tech., Rapid City, S. D. Trips to Black Hills, White River Badlands, Keystone area and Homestake Mine to study Precambrian, Paleozoic and Mesozoic of areas. Write: E. L. Tullis, S. Dak. School of Mines, Rapid City, S. D. Guidebook.

*April 28-30, 1960—AIME: 13th Ann. Pacific NW Metals and Minerals Conf., Sheraton Hotel, Portland, Ore. Field trips.

April 29-30, 1960—MISSISSIPPI ACAD. OF SCIENCES, Inc., Millsaps College, Jackson, Miss. Write: Dr. C. Q. Sheely, Miss. State Univ., State College, Miss.

April 30, 1960—IDAHO ACAD. OF SCIENCE, second ann. meeting and phosphate symposium. Guest lecturer: Dr. Harlow Shapley. Idaho State College, Pocatello. Write: A. E. Taylor, I.S.C.

May 2-3, 1960—AIME: SOC. PET. ENGNRS., 4th Biennial N. Texas Secondary Recovery Symposium. Wichita Falls, Texas.

May 5-6, 1960—AIME: Ann. Joint Meeting, Rocky Mountain Petr. Sects., Calgary, Alta.

*May 5-10, 1960—GSA; Cordilleran Sect., Vancouver, British Columbia. Road log trips from Vancouver to Squamish, Fraser Canyon, Texada Is., and damsites to study metamorphics, Cascade Mtns., economics and geology. Write: W. H. Mathews, Dept. of Geol., Univ. of B.C., Vancouver 8, B. C. Guidebooks.

May 6-7, 1960—SSA: Vancouver, B. C., Canada.

May 14-15, 1960—MIDWEST FRIENDS OF THE PLEISTOCENE, Ann. Meeting, Eastern South Dakota. Write: Allen F. Agnew, State Geologist, South Dakota Geological Survey, Vermillion.

*May 25-28, 1960—AAPG: Western Canada Regional Meeting with Alberta Soc. of Petr. Geol. as host, Banff Springs Hotel, Banff, Alta. May 28, trips from Banff to Golden, B. C., and to Minnewanka-Canmore area to study structure of Rocky Mtns. and Devonian, Mississippian and Lower Mesozoic of Banff area. Write: G. G. L. Henderson, Calif. Standard, Medical Arts Bldg., Calgary, Alta., Canada. Maps and Notes.

June 20-23, 1960—CANADIAN SOIL SCIENCE SOC., Ann. Meeting, Guelph, Ont., Canada.

July 25-Aug. 6, 1960—IUGG: General Assembly, Helsinki, Finland. Inquire: Sec. Gen. G. Laclavere, 30 Avenue Rapp, Paris 7, France.

*Aug. 6-12, 1960—19th INTERNATIONAL GEOGRAPHIC CONGRESS, General Assembly of the IGU and meetings of the IGU Commission, Stockholm, Sweden. Inquire: The International Geographic Congress Postfack Stockholm 6, Sweden.

Aug. 14-24, 1960—7th INTERNAT. CONGRESS OF SOIL SCIENCE, Madison, Wisc.

*Aug. 15-25, 1960—XXI INTERNATIONAL GEOLOGICAL CONGRESS, to be held at the Mineralogical Geological Museum of the University of Copenhagen in Denmark. Field trips before and after the meetings.

Aug. 20-25, 1960—INTERNAT. MINERAL. ASSOC., 2nd General Meeting; Mineralogical Museum, Univ. of Copenhagen, Denmark.

Aug. 30-Sept. 2, 1960—ELEVENTH ALASKA SCIENCE CONF., sponsored by AAAS, Alaska Division, Cook Inlet Branch, Anchorage.

Sept. 11-16, 1960—AMER. CHEM. SOC., 138th Meeting, New York City.

Oct. 2-5, 1960—AIME: Soc. of Petr. Eng., Fall meeting, Denver.

Oct. 5-7, 1960—AIME: Rocky Mountain Minerals Conf., Newhouse Hotel, Salt Lake City, Utah.

Oct. 6-8, 1960—9th NATIONAL CLAY CONF., Purdue Univ., Lafayette, Ind. Write: J. L. White, Agronomy Dept., Purdue Univ.

Oct. 12-14, 1960—AAPG: SW Fed. of Geological Soc's., 3rd Ann. Meeting, Abilene, Texas.

Oct. 13-15, 1960—OPTICAL SOC. OF AMERICA, Somerset Hotel, Boston, Mass.

Oct. 18-21, 1960—ACerS: 13th Pacific Coast Regional Meeting, Ambassador Hotel, Los Angeles, Calif.

*Oct. 19-21, 1960—GULF COAST ASSOC. OF GEOL. SOC'S., 10th Ann. Convention, Buena Vista Hotel, Biloxi, Miss. Host: Miss. Geol. Soc. Theme: "The Future of Gulf Coast Oil." Technical sessions, entertainment and post meeting field trip. Write: A. E. Blanton, Gen. Chrmn., P. O. Box 422, Jackson, Miss.

Oct. 20-21, 1960—AIME: Los Angeles Basin Sect., Fall Meeting, Huntington Sheraton Hotel, Pasadena, Calif.

*Oct. 31-Nov. 3, 1960—GSA: Ann. Meeting, in conjunction with PS, MSA, GS, SVP and SEcG, Denver Hilton Hotel, Denver, Colo. Field trips before and after the meetings, also local excursions. Write: E. D. McKee, U.S. Geol. Survey, Federal Center, Denver, Colo.

Nov. 7-10, 1960—SEGp: 30th Ann. Internat. meeting, Moody Convention Center, Galveston. Write: W. B. Lee, Jr., Gulf Oil Corp., Dr. 2100, Houston 1, Tex.

Dec. 2-3, 1960—N.A.G.T., Texas Sect.—Texas Acad. of Sci.; Texas Christian Univ. Campus, Fort Worth, Texas.

Dec. 26-31, 1960—AAAS, Annual Meeting, New York City.

## 1960 SCHEDULE OF FIELD TRIPS

*For additional field trips held in conjunction with meetings, see those items marked with an asterisk under meeting calendar.*

April 15-16—SEPM: Pacific Coast Sect., Ann. Spring Field Trip, Panoche Hills, Calif. Dinner meeting at The Hacienda, Fresno, Calif. Write: R. L. Brooks, 5900 Cherry Ave., Long Beach 5, Calif. Guidebook.

April 15-16—SEPM: PERMIAN BASIN SECTION, trip to Bend Arch area of Eastland and Stephens Counties to study problems of Canyon and Cisco of Upper Penn. Write: Thomas Hambleton, Box 1270, Midland, Texas. Guidebook.

April 16—ILLINOIS STATE GEOL. SURVEY, trip to Marion Co., Ill. to study surface Pleistocene, Omega ls., and some oil fields. Write: George M. Wilson, Ill. St. Geol. Survey., Nat. Resources Bldg., Urbana, Ill. Guidebook.

April 23—ILLINOIS STATE ACAD. OF SCIENCE, trip to Mississippi R. bluffs to study Classic Mississippian System outcrops. Write: Academy at Quincy College, Quincy, Ill.

**FIELD TRIP CALENDAR**

Most of the information regarding field trips in this calendar appears through the courtesy and cooperation of the AAPG Field Trip Committee. Corrections, additions and new trip notices should be sent to George H. Fentress, Chairman, AAPG Field Trip Committee, P. O. Box 2585, Denver 1, Colo., with a carbon copy to GeoTimes Calendar, American Geological Institute, 2101 Constitution Ave., N.W., Washington 25, D. C.

April 28-May 1—MISSISSIPPI GEOLOGICAL SOC., & SEPM-GULF COAST SECT., trip to coastal Mississippi and SW Alabama to study Recent marine sediments and Cenozoic. Write: F. X. Bland, California Co., Box 822, Jackson, Miss. Guidebook.

April 29-30—CORPUS CHRISTI GEOL. SOC., Ann. Field Trip, Maverick and Val Verde Counties, Texas. Write: L. Joe Sockwell, Sun Oil Co., Box 2431, Corpus Christi, Tex.

May 4-8—SGE: KANSAS STATE CHAPTER, trip to St. Francis Mts. and Central Arkansas. Write: Henry Beck, Kansas State Univ., Dept. of Geol., Thompson Hall, Manhattan, Kans. Guide Book.

May 6-7—SOUTHEASTERN GEOL. SOC., 9th Field Trip to Crystal River, Hawthorn, Alachua and Bone Valley formations, unnamed coarse clastics and Pleistocene of Central Fla. Trip by pre-registration only. Write: Soc., P.O. Box 841, Tallahassee, Fla., by April 29.

May 7—ILLINOIS STATE GEOL. SURVEY, trip to Jersey Co., Ill. to study Cap au Gras fold and history of Ill. and Miss. R. valleys. Write: George M. Wilson, Survey, Urbana, Ill. Guidebook.

May 10?—NEW YORK STATE GEOL. ASSOC., trip to Central New York in vicinity of Clinton to study stratigraphy, paleontology and geomorphology, largely Paleozoic. Write: Dr. David Hawley, Hamilton College, Clinton, N.Y. Guidebook.

May 15?—HOUSTON GEOL. SOC., trip probably to Grimes Co. Texas to study Miocene outcrops. Write: Society, 234 Esperson Bldg., Houston, Texas. Guidebook.

May 20?—FIELD CONF. OF PENNSYLVANIAN GEOLOGISTS, trip to SE Penna. to study Piedmont Paleozoics of Triassic lowlands. Write: M. N. Shaffner, Bur. Topo. & Geol. Survey, Harrisburg, Pa.

May 21—ILLINOIS STATE GEOL. SURVEY, trip to McHenry Co., Ill. to study glacial features of Wisconsin and Ordovician and Silurian rocks. Write: George M. Wilson, Survey, Urbana, Ill. Guidebook.

May 21-22—EASTERN FRIENDS OF PLEISTOCENE GEOLOGY, Ann. Meeting, western New York glacial geology, Dunkirk, N. Y. Inquire: E. H. Muller, Geol. Dept., Syracuse University, Syracuse 10, N. Y.

Aug. 3-5—WYOMING GEOL. ASSOC., trip to Big Piney-LaBarge area, Snyder Basin and Wind River Mtns. to study geology of westernmost Wyoming overthrust belt. Write: C. A. Burk, Box 1331, Casper, Wyo. Guidebook.

Sept. 8-10—INTERMTN. ASSOC. OF PETR. GEOLOGISTS—E. NEV. GEOL. SOC., joint field trip, to include the geology of Central Nevada in the Ely region. Write: Walter M. Winfrey, Box 269, Ely, Nevada.

Sept. 9-10—FRIENDS OF THE PLEISTOCENE, field trips at Promontory Point (SP Railroad) gravel pit in Little Cottonwood Creek area (20 mi S of Salt Lake City). Lake Bonneville stratigraphy and correlations with glacial units. Write: R. B. Morrison, U.S.G.S., Federal Center, Denver, Colo., or H. D. Goode, U.S.G.S., 503 Federal Bldg., Salt Lake City, Utah.

# This Month in GEOTIMES

Professional News Magazine

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Robert C. Stephenson, EDITOR

Kathryn Lohman, CIRCULATION MANAGER

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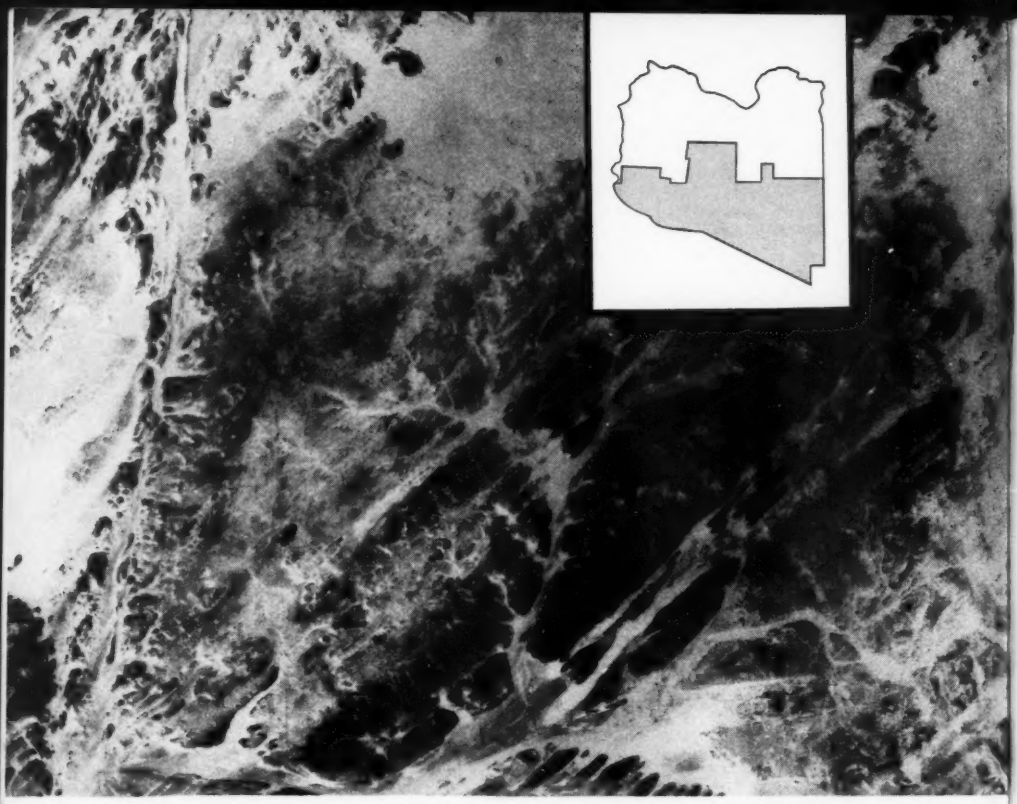

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# National Register

AGI already has or soon will mail over 20,000 survey forms to geologists and solid earth geophysicists to obtain up to date information on geoscientists of all specialties for the National Register of Scientific and Technical Personnel. All told, the societies participating along with AGI in the maintenance of the National Register will be contacting 225,000 to 250,000 scientists, to seek data for this science-wide register. This is a continuing project conducted in cooperation with the National Science Foundation.

Those of you receiving this request for information on your scientific training and experience are urged to complete and return the survey form promptly in order to minimize follow-ups.

You ask—what's in it for me? The Register, started in 1953, is accumulating valuable statistics on the trends in growth and development among the various scientific disciplines. Tangible evidence of these statistics appeared in GeoTimes, Nov.-Dec. 1959, pages 14-16, in the article *"Professional Dimensions of the GeoSciences."* Data such as are published in this article were compiled from the Earth Science Register. These data are being used daily in analyzing employment matters, educational trends, new areas of specialization and other matters of professional importance.

The underlying purpose of the National Register is, of course, to provide data on scientific manpower in times of national emergency. Register survey forms are not knowingly sent to citizens of other countries nor are these people included in Register analyses. Canada and a number of other countries of the world have a similar manpower roster.

Your completed survey form returned promptly will contribute to a more accurate yardstick for measurement of our scientific dimensions. *Don't bury it—return it!*

OUR COVER

Professor Maurice Ewing, Director, Lamont Geological Observatory, winner of the first Vetlesen Prize for achievement in the earth sciences. (see page 16) Bruno Figallo—artist.

The AMERICAN GEOLOGICAL INSTITUTE is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

GEOTIMES is the news magazine of the geological sciences. It reports on current events in the earth sciences, public education and public relations efforts throughout the profession, as well as appropriate legislative and governmental issues. It announces scholarships, fellowships, publications and new developments. It provides a forum for discussion of timely professional problems, and affords a common bond between the many specialized groups within the earth sciences

# GEOLOGY IN DENMARK

by THEODOR SORGENFREI [1]

It is certainly correct to assume that most geologists have only very vague ideas about geology and geologists in Denmark. They shall, however, not be blamed on account of their ignorance. The old kingdom of Denmark is admittedly a small country, a little spot on the globe, although it looks more impressive if we remember that the world's largest island, Greenland, belongs to its territory.

The number of professional geologists in Denmark has always been small. This is partly due to the lack of important natural resources which might form the basis for mining and economic geology. Against this rather unfavourable background it is noteworthy that there is a relatively lively interest in geology among the people of Denmark. Geology is thus taught at High School from the 14th year class. Every Danish student is accordingly familiar with the general concepts of our science.

If we look back through the history of geology in Denmark, the name of Niels Stensen, also known as Nicolaus Steno, shines more than any other name. His fame in science is due to his brilliant discoveries in human anatomy, and the cognition of the true nature of fossils, the principles of sedimentation and stratigraphy, and the laws of crystal growth. His fundamental ideas in geology which look modern even to the geologist of to-day, were set forth from 1667 to 1669 during his stay at the court of the Grand Duke Ferdinand II in Florence. It happened at a time when fossils and crystals were thought to be freaks of nature, possibly produced by the stars or some force in the Universe outside the earth. Steno's ingenious intellect had thus brought him far beyond his predecessors and contemporaries. However, he simultaneously underwent a religious evolution which finally resulted in his abjuration of the Lutheran protestantism and the abandonment of scientific work.

The reach of Steno's geological discoveries was not recognized by his contemporaries. His doctrines were even partly rejected, and finally they fell into oblivion, being a clear evidence that time was not yet ripe for his original views. Steno's works were again brought to light by Alexander von Humboldt and Elie de Beaumont at the beginning of the 19th century when geology developed into a generally accepted science. The Second International Geological Congress in Bologna in 1881 honoured Steno with a memorial tablet at the church of San Lorenzo in Florence where Steno was buried. It is expected that the Roman Catholic Church will canonize Steno in recognition of his religious life.

Steno's geological work was made outside his native country. The first approach to systematical geological research in Denmark was made at the beginning of the 19th century when J. G. Forchhammer became professor of mineralogy and geognosy at the University of Copenhagen. He compiled the first geology of Denmark issued in 1835. During Forchhammer's professorate and while his successor F. Johnstrup had the chair in mineralogy, a rather good outline of the geology of the country was accomplished although real mapping was not carried out. For various reasons, the Geological Survey was not founded until 1888. The inquiry in Parliament which led to its foundation was made by one of the members who asked the Minister of the Interior whether it was not time for Denmark to undertake, like other civilized

[1] Geological Survey of Denmark, Tranegaardsvej 20, Hellerup Denmark. Dr. Sorgenfrei is General Secretary, Organizing Committee, XXI International Geological Congress.

This article is fifth and last in a series of five on geology and geologists of the Nordic countries that will be hosts to the geologists of the world attending the XXI International Geological Congress, Copenhagen, August 15-25, 1960. See GeoTimes October 1959 (Sweden), Nov.-Dec. 1959 (Norway), Jan.-Feb. 1960 (Finland), Iceland (March 1960).

states in Europe and America, a thorough investigation of her soil!

### Geological Survey Organized

Shortly afterwards, the Geological Survey was organized, and geological mapping of the country began. Reviewing the geological topics to which Danish geologists have been devoted since then, it may be practical to remember that the major part of the country is covered by a relatively thick blanket of glacial drift. It should, furthermore, be borne in mind that Denmark occupies a geologically strategic position between the high lying Precambrian basement shield of Scandinavia, known also as the Fennoscandian Shield, and the central European sedimentary basins.

The study of the Quaternary deposits has had a dominant position in the scientific programme of the Geological Survey during its first 50 years of existence. The stratigraphy of the glacial deposits, the history of vegetation, the climatic development, the fossil content of interglacial and postglacial marine deposits, etc., have been studied. Among the methods applied, the statistical treatment of special types of erratic boulders known as indicator boulders deserves mention. On the basis of their quantitative distribution, the main problems of the Pleistocene glaciations have been discussed, and the migration paths of the ice sheets have been illustrated. Besides, the study of the geomorphology of the glacial deposits has contributed considerably to the understanding of the history of the glaciations.

Co-operation between archeologists, botanists, zoologists and geologists regarding pre-historic man resulted early in the recognition of the main features of vegetational history by the study of bog deposits. The results obtained in Denmark were followed up by additional work in the neighbouring Scandinavian countries which finally gave rise to the development of the pollen analytical method by L. von Post in Sweden.

Pollen analysis was immediately applied to deposits in Denmark and it soon played and still plays an important role on the

**Figure 1.** Svanninge bakker, island of Fyn, Denmark. Terminal moraine landscape.

**Figure 2.** Cliff of Stevns Klint, island of Sjaelland, Denmark. Danian limestone superposing Senonian White Chalk. Type locality of the Danian.

study of Danish Pleistocene and Holocene deposits. It is now pursued by a number of laboratories among which those of the Geological Survey and the Natural Science Department of the National Museum are the leading ones. These laboratories have refined the pollen method to an ever increasing accuracy and combined it with radio carbon datings to a stratigraphic tool of a high standard.

The geology of the pre-Pleistocene formations was treated by geologists of the staffs of both the Mineralogical-Geological Museum of the University and of the Geological Survey. Originally it was the richly fossiliferous beds of the Paleozoic and Mesozoic formations on Bornholm, and the Cretaceous and Tertiary in the rest of the country that challenged Danish geologists and paleontologists. Numerous monographs on fossil faunas show the great

**Figure 3.** Ella o, East Greenland. Harbour at the Ella o base of the expeditions in East Greenland.

**Figure 4.** Northern part of Scoresby Land. East Greenland. View on the Alpine summits from a bi-plane. Precambrian. Eleonora bay formation.

interest in the beautiful world of fossils.

Already at an early time geologists contacted well drillers and collected drilling samples in order to compile data on the subsurface. Efforts were favoured by the circumstance that a Danish driller had invented a flush drilling method at the end of the 19th century. He drilled a number of water wells which were deep for the time. On the basis of data from wells it was soon possible to get a rough outline of the distribution of the pre-Pleistocene formations at the base of the glacial drift.

In 1926 a water law was passed in Parliament according to which all data from water wells in Denmark should be reported to the Geological Survey. The Water Well Record Department was subsequently organized by Dr. H. Odum who is now the director of the Geological Survey. This department has worked ever since as archives of subsurface data and being at the disposal both for scientific research, practical consulting in water supply, and other branches of economic geology.

### Oil Exploration

Prospecting for oil was going on in Denmark with interruptions from 1936 to 1959. A large amount of geophysical and geological data, well logs, etc., were derived from the exploration work and finally filed at the Geological Survey. These data on the deep subsurface are an extremely valuable supplement to the data on the shallow subsurface obtained through the search for groundwater, lignite etc.

About 80,000 well logs are at present on file at the Geological Survey, and about as many drilling samples are kept in the storehouses of the Survey, all for further research. However, we know already now that the major part of Denmark was a sedimentary basin during the late Paleozoic, Mesozoic, and Cenozoic, that continental and marine periods changed through the ages, and that the tectonic pattern is a combination of fault and fold structures with salt tectonics.

### Greenland Geology

The geological investigation of Greenland was initiated at the beginning of the 19th century when the German geologist Gieseke travelled along the west coast. He was the first geologist to investigate the famous kryolite occurrence at Ivigtut. From the beginning, geological work in Greenland has thus been carried out on expeditions which made the work still more attractive for adventurous people.

In 1875 financial support was obtained from the government for scientific work in Greenland. The mineral deposits of southern Greenland and the sedimentary areas of the east and west coast did first attract interest. These excellently exposed regions in many ways offer the best conditions for geological studies although work on the east coast may often be hampered severely by the polar ice. Sometimes the ice blocks the coast all the year round, and it was thus formerly not unusual that an expedition had to winter twice instead of once.

The enthusiasm of the members of the many expeditions overcame difficulties in most cases, and the scientific results have accumulated in a large number of geological papers, which chiefly have been published in the series of *Meddelelser om Grönland*. A wealth of topics have been treated ranging from Crossopterygians, and fossil funas over sedimentary petrology to the geology of metamorphic rocks, Tertiary volcanism, Caledonian orogeny etc. Most expeditions have been under the charge of Danish geologists, and the majority of active Danish geologists have periodically worked in Greenland. However, a large

proportion of the geological staffs of the expeditions came from other countries thus contributing to the international co-operation of geologists.

It is difficult to give a review of the results of the immense amount of geological work on a limited space. Some of the most outstanding achievements should, however, be mentioned.

Regional mapping on the East Greenland coast has had remarkable progress under the leadership of Dr. Lauge Koch. Mapping of the area from 77° to 72° n. Lat. to the scale of 1:250,000 was recently completed. The maps hitherto published include a great number of details on sedimentary formations, metamorphism, and structure. It must, however, be added, that in some remote areas the maps had to be generalized on the basis of a rather few data. Of general scientific importance were the finds of Crossopterygerians and other fossil vertebrates in Devonian and Eotriassic formations in East Greenland. They have contributed considerably to the understanding of the systematic subdivision of the vertebrates. The discovery of the Precambrian Tillites may be ascribed a similar importance. They were first observed by Professor Christian Poulsen.

Economic geology had some success by the discovery of the zinc-lead sulphide ore at Mestersvig, which was located after World War II. A recently discovered molybdenum occurrence at Mestersvig cannot yet be fully estimated; exploration work is still going on.

While a large number of geologists worked in East Greenland since the twenties of this century, the west coast was somewhat neglected until 1938 when Professor A. Rosenkrantz organized his first expedition to the Nugssuaq peninsula supported by the Carlsberg Foundation. The work was interrupted by World War II. However, it was afterwards resumed, and mapping of the sedimentary area of central West Greenland and of the Precambrian region of south-western Greenland was intensified under the leadership of Professor Rosenkrantz and Professor A. Noe-Nygaard.

The Geological Survey of Greenland was subsequently organized as a provisional institution which now awaits confirmation as a permanent Survey by the Danish Government.

The areas mapped in Western Greenland have been surveyed in great detail. Maps are under preparation and will be published in a near future. Some of the most important results are the identification of fossiliferous Danian deposits in the Nugssuaq peninsula, and the location of

**Figure 5.** Nugssuaq peninsula. West Greenland. Ata valley. Tertiary Plateau Basalt. Professor A. Rosenkrantz is sitting in the foreground.

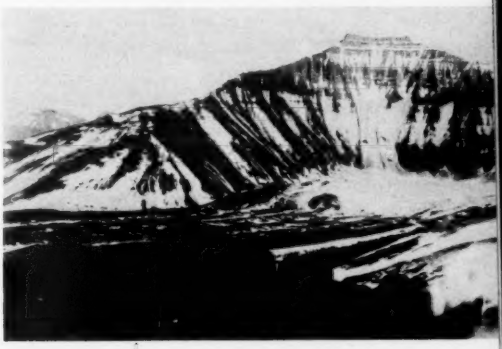

**Figure 6.** Nugssuaq peninsula. West Greenland. Mountain of Qilertinguit, 1968 m. high. Tertiary Plateau Basalt.

uranium bearing Lujavrite in a domal structure at Julianehaab in southern Greenland. Mining of the uranium deposit has preliminarily proved uneconomic.

### Kryolite

Incidentally, the most famous mineral deposits of Greenland is the kryolite occurrence at Ivigtut which also is situated near Julianehaab. It was known by Greenlanders before geologists went to the area. The occurrence is found in a granite intrusion, and the kryolite is accompanied by minor amounts of impurities as Siderite, Quartz, Galena, Sphalerite Pyrite etc. The kryolite mine has been in operation since 1854 and it will probably be exhausted within the next 10 years.

Of particular interest are the new geological investigations of the Ivigtut region carried out by the Geological Survey of Greenland. The kryolite occurrence has been dated to late Gardar age. Absolute age determinations indicate an age of the order of 600 million years.

*(Continued on page 25)*

## Some Observations on

# GEOLOGIC MAPPING by HELICOPTER

*by* CHAS. B. HUNT [2]

Recently, in connection with a general geologic study in Death Valley, California, I had opportunity to use a helicopter for mapping geology from the air on a scale of 1 inch equals 1 mile. This experience is described for such help as it may provide others who may be considering the method and who know as little about it as I did when the operation started.

The Geological Survey of Canada has led the way in use of helicopters for geologic mapping. Their experiences on 9 major operations involving 4600 hours of flying time and a half million square miles of geologic mapping, mostly reconnaissance, are presented together with cost and other operational data in their recently published and very useful bulletin 54 (Helicopter Operations of the Geological Survey of Canada, price 75¢). There have been other such experiences. Oil company and mining geologists have used helicopters; the Mississippi Geological Survey has owned one. The Death Valley project provides another kind of example.

Death Valley is a northerly trending valley 10 to 12 miles wide, and an 80-mile stretch of it is below sea level (fig. 1). The part below sea level is mostly salt pan; gravel fans surround it and rise 1500 to 2000 feet to the foot of the adjoining mountains. These readily accessible parts of the Valley had been mapped by me by conventional ground methods during the first years of the study.

Along the east side of Death Valley are the Funeral Mountains and Black Mountains which reach altitudes of about 6,000 feet. But only the lower parts of these mountains were involved in this study and those parts posed no major problems of access.

Along the west side of Death Valley, however, is the lofty Panamint Range with crest more than 11,000 feet higher than the salt pan and only 12 miles away. During the winter of 1958-59, about 100 square miles of the lower part of the Panamint Range, to an altitude of about 4,000 feet, had been mapped in 4½ man-months. This mapping was done on foot and covered the most accessible parts of the mountains. At the conclusion of this phase of the project, there still remained to be mapped about 200 square miles of the Panamint Range, all of it very much rougher and higher than the part that had been mapped.

If this rough, virtually roadless area were to be mapped by conventional methods it would be necessary to establish camps and use pack animals for supplying them. The work would have progressed so slowly as to be prohibitively costly in time and money. It was decided to try mapping the area by helicopter. I have been asked what prompted the idea of using a helicopter; to be truthful, the idea came while mapping the lower 4,000 feet of those mountains on foot and looking up and seeing about twice as much mountainside still remaining to be done!

The Panamint Range consists of Precambrian and Paleozoic formations, mostly dipping east and broken by high angle and low angle faults. In the high part of the mountains are two large monzonitic intrusions. Exposures are superb, for there is almost no soil cover except on parts of

[1] Publication authorized by the Director, U.S. Geological Survey.

[2] Geologist, U.S. Geological Survey, Denver, Colorado.

EDITOR'S NOTE: For a directory of Helicopter Operators, see *UP-COLLECTIVE*, official publication of the Helicopter Association of America, v. 1, n. 2, p. 48-49.

the crest. Some stands of timber grow on the uppermost one or two thousand feet of the Range, but the vegetation generally is sparse and the geology is well exposed. The structure and stratigraphy of the formations had been learned while mapping the foothills and, in addition, fossils had been collected at accessible places farther into the mountains to serve as tie points (about 75) for the stratigraphy and structure that was to be mapped from the air.

Bids were invited to provide 50 hours flying by helicopter over the area to be mapped. The helicopter was to base at headquarters of the Park Service (NPS in fig. 1), about 10 miles across Death

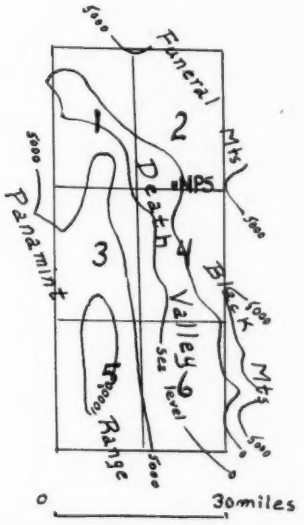


**Figure 1.** Sketch map of Death Valley. 1. Stovepipe wells quadrangle; 2. Chloride Cliff quadrangle; 3. Emigrant Canyon quadrangle; 4. Furnace Creek quadrangle; 5. Telescope Peak quadrangle; 6. Bennetts Well quadrangle. NPS, headquarters of Park Service and base for the project.

Valley from the Panamint Range. It was specified that the helicopter must be capable of flying at altitudes from below sea level to 11,000 feet and that it must have at least 310 horsepower. The craft finally obtained, a Hillers 12 E, would operate well above 13,000 feet. The contract also contained stipulations about training and licensing of the pilot, maintenance crew, and of the ship and about liabilities. No facilities for servicing or fueling helicopters or planes are available in Death Valley; the contracting company had to provide maintenance crew as well as pilot and had to have aviation gasoline trucked in.

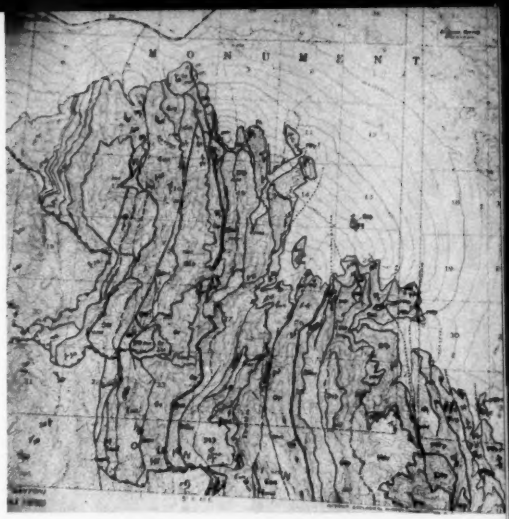


**Figure 2.** Photograph of part of a field sheet to illustrate the degree of detail obtained mapping the Panamint Range by helicopter.

### Contract

A common type of helicopter contract provides for standby time as may be needed by the geologist. A contract providing 1½ hours of standby for each hour of flying in Death Valley might cost $150 per hour of flying. We did without the standby time and specified that any such time required (other than for weather) would be counted as flying time. To help further in obtaining as low rate as possible, the contract also provided that the contractor could schedule the flying at anytime during a particular 2½ month period. The accepted bid was for about $80 an hour.

A very different form of contract and for a longer term is reported by the Geological Survey of Canada. For example, for a 3 month field season on Cape Breton Island their contract provided $7000 per month fixed charges plus $20 per operating hour plus $900 for helicopter transportation to and from the field.

A helicopter cruises about 80 miles an hour when ferrying; we cruised about 40 miles per hour while tracing and mapping contacts. The ship must be refueled about every 3 hours; time on the ground for refueling is not counted as flying time. Little time was lost refueling because the ground crew would drive the maintenance truck, equipped with gas tank, to a rendezvous near the part of the area being flown that day; most of the flights required no more than about 5 miles flying to refuel.

It was first planned to map the area valley by valley, and to cross check this mapping by tracing key units across intervening ridges. This is a conventional approach when mapping on foot, but in trying this from the air several difficulties were encountered. In a single valley there is difficulty distinguishing which structures are major, and the numerous minor structures swamp the mapper with detail. I found it difficult to estimate distances from the air and the fast changes in angle of view made it difficult to plot precise locations of observable detail.

### Map Feature by Feature

The area by area approach then was abandoned in favor of flying along major faults and along normal contacts. This served to outline major map units, mostly thrust fault blocks, and these blocks were further subdivided until a satisfactory degree of detail had been achieved. When mapping from the air it is easy to progress from the general to the details, whereas mapping on the ground progresses the other way. From the air it is easy to see the big units and to ride the contacts around them, and when this is done the subunits can be recognized and their boundaries traced. Slightly less detail was obtained in mapping from the air than in mapping by conventional methods. The difference reflects the fact that the major structures are evident and easily followed and mapped from the air; the lesser structures can be and are neglected. Figure 2 illustrates the degree of detail that was obtained.

The geology was plotted directly on the topographic base maps rather than on the air photographs. Every contact on the map literally was "ridden out"; for all practical purposes the faults and contacts shown on the map are flight lines. The ship's vibrations did not affect the plotting.

Although our contract provided no standby time, I found it desirable to stop about every 30 minutes, land at vantage points, and there catch up on the map sketching. We averaged 10 to 15 landings each day, 2 or 3 of which were for refueling.

We were able to fly 6 to 8 hours a day and map 150 to 300 miles of contact. Each evening the mapping was refined by studying the air photographs, which helped determine locations more closely. Because the relief is great, much of the north slopes on the air photographs is in shadow, and the bottoms of some narrow canyons that show only along the edges of the pictures are viewed too obliquely to determine the formations in them. These difficulties with the air photographs in this area are why I preferred to plot the geology on the topographic maps rather than on the pictures. Additional strikes and dips calculated from the photographs can be added to supplement those obtained during the flying.

### Economy Surprising

A total of almost 200 square miles was mapped in 50 hours of flying, and as noted before, this mapped area is much rougher and higher than the 100 square miles that had been mapped in 4½ months on foot. To have achieved an equal amount of mapping in that area would have required a long time, at least 9 months of field work and probably 12 by a geologist and field assistant. The cost of the helicopter for 50 hours, $4,050, is about half the cost of trucks and pack animals for 9 to 12 months. In addition to this saving, the speed of the work by helicopter represents savings in subsistence and salary for a geologist and an assistant for a period of 9 to 12 months, less about a month for the additional work on the ground that still is needed. Eighty dollars an hour for field work sounds expensive, but it buys 20 to 40 hours of mapped contacts in an area where ground movement would be exceedingly slow. On this project, the phase of the work that was done by helicopter plus the additional work still needed cost about $7,500. This is one-third to one-fourth the costs of doing the same work by ground methods. Similar economies are indicated by the experiences reported by the Geological Survey of Canada.

Mapping from the air of course has its limitations. It needs to be emphasized that the mapping could not have been done satisfactorily from the air without the previous experience on the ground. I doubt if the method would be suited for mapping complex geology that is strange, or for mapping formations that are not readily distinguished from a distance. Locations and strikes and dips are approximate. Additional work on the ground is needed to obtain critical details that could not be studied from the air, such as relationships along the contacts of intrusions. Additional fossil collections are needed to confirm identification of the formations as mapped. But this additional ground work involves hikes to specific places, which is a very different problem in logistics from having to systematically cover the whole of a rough mountain mass.

During the first half of the project the

*(Continued on page 40)*

# GEOLOGY in the Public Eye

by Robert L. Bates

Department of Geology, Ohio State University
Columbus Ohio

In January and February, more than 5,000 6th- and 7th-graders in Columbus, Ohio, were introduced to geology via TV. Six half-hour lessons were given, as part of a regular science series telecast every Tuesday of the school year by Ohio State's WOSU-TV. Geology was most attractively represented by Mrs. Carolyn Farnsworth of the Ohio Geological Survey. She was aided by Mr. William Hagans, the TV classroom teacher. A guide for the series, and supplementary reference materials, were sent to the teachers, so that they could arrange extra activities before or after the telecasts. Ohio State's departments of geology and mineralogy helped supply specimens, models, pictures, film strips, and a movie. The six subjects: *Earth History* (general definitions, time scale, fossils); *The Earth's Changing Surface* (volcanism, mountain building, erosion); *What is a Rock?* (specimens and descriptions of common types, especially those of Ohio); *What is a Mineral?* (helped out by a youngster who brought part of his mineral collection and discussed it); *Earth Resources* (prospecting, drilling, mining, processing); and lastly a general review and an introduction to *Mineral Conservation*. Teachers and parents report enthusiastic student interest. Among indications of this is an increase in the number of 6th-grade visitors to Ohio State's geological museum in Orton Hall. It is now planned to present geology next year in a 10- or 12-lesson series, this time addressed chiefly to 7th-graders.

Geology and geophysics were well presented on Shell Oil Co.'s TV commercial during the Children's Concert on Feb. 7. Not only were Leonard Bernstein and the New York Philharmonic in superb form, but we were shown a Brunton compass in use, geologists debouching from a helicopter, an anticline containing oil and gas, and a seismic shot with animated wave fronts moving through the rocks. We thank Shell for this almost unheard-of phenomenon: a TV show in which even the commercials were good.

This is the Public Eye's 50th column. And a happy semi-centennial to *you!*

## Penrose Medalist

**Dr. John S. Brown (center) receives the Penrose Medal from J. L. Gillson, President of the Society of Economic Geologists (center) as Clayton Ball, Chairman of the Penrose Award Committee looks on. Dr. Brown, an outstanding economic geologist, is widely recognized and known for research and publications in the field of economic geology and on structure and stratigraphy of Precambrian rocks. As the 14th recipient of the Penrose Medal since it was established in 1923, Dr. Brown was honored at the SEG Luncheon during the Annual AIME meeting in New York. Speaking before the Society, L. C. Graton commemorated the 100th anniversary of the birth of Waldemar Lindgren. Past President of the United States, Herbert Hoover, appeared briefly before the assembled members to pay tribute to Dr. Lindgren for whom he had worked on a U.S.G.S. summer field party while a student at Stanford University.**

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## Stanford Receives Minerals

Delmar L. Daves, a veteran Hollywood director-writer recently presented a mineralogical collection valued at $15,000 to Stanford University, his alma mater. Daves, who did not become interested in mineral collecting until 1944, amassed and indexed the collection which consists of more than 1000 museum quality specimens, 5000 crystal, mineral and ore specimens for student use and more than 4000 rock specimens. Also included in the gift were 200 books on mineralogy. The 50 volume "index of mineral association" is a unique method developed by Mr. Daves.

Mr. Daves in his lengthy career as a screen writer, director and producer has been associated with the making of many movies.


"The Heavens Declare the Glory of God and the Firmament Showeth His Handiwork"

# THE VETLESEN PRIZE

**for achievement in the earth sciences awarded to Maurice Ewing**

The newly-created Vetlesen Prize brings to the earth sciences an international recognition for scientific achievement comparable to the coveted Nobel Prizes for physics, chemistry, medicine, literature and peace.

Professor Maurice Ewing, Director of the Lamont Geological Observatory at Columbia University, was selected as first recipient of the Vetlesen Prize for his outstanding contributions to the advancement of scientific knowledge in oceanography. The prize consists of a gold medal, an award of $25,000 and support of publication of the recipient's scientific papers.

The Vetlesen Prize was established by the G. Unger Vetlesen Foundation in 1959 to recognize *scientific achievement resulting in a clearer understanding of the earth, its history or its relation to the universe.* The prize was established by the trustees of the Foundation in honor of the late Georg Unger Vetlesen who established the Foundation shortly before his death in 1951.

Scientists from any country of the world may be nominated for the Vetlesen Prize which will be awarded every two years, provided a worthy candidate is presented. The prize was established in Columbia University by the Vetlesen Foundation trustees, W. Barrett Brown, New York investment banker, President; Christian J. Mohn, president of the Norwegian American Line Agency, Inc.; Edmund C. Monell, stepson of Mr. Vetlesen; and Henry C. Walter, Jr., New York attorney.

In the light of Mr. Vetlesen's life-long interest in the sea, the trustees of the Foundation felt it appropriate that the first Vetlesen Prize should be awarded to an outstanding scientist for achievement in oceanography. The Foundation trustees reserved the right to name the first recipient of the prize, but the subsequent selections of those to be honored will be made by a panel of jurors selected by the University. It is significant to note that the Vetlesen Prize is the second major award program of international scope to be established at Columbia University. The Pulitzer Prizes in Journalism and Letters were endowed by a bequest to the University by publisher Joseph Pulizter.

The award was made to Professor Ewing in ceremonies which followed a candlelight dinner in the impressive rotunda of the Low Memorial Library on the Columbia campus on March 24. Prominent scientists from other countries were among the nearly three hundred guests of the occasion. These included Prof. J. T. Wilson, University of Toronto, President of the IUGG; Prof. H. Mosby of the University of Bergen; Sir Edward Bullard, Cambridge, England; Prof. F. A. Vening-Meinesz, president of the Netherlands Geodetic Commission; Miss Inge Lehmann of Copenhagen, Denmark; and Professor George Wuest, University of Kiel. Dr. Alan T. Waterman, Director of the National Science Foundation, principal speaker of the occasion spoke of the varied and highly important scientific achievements of the Vetlesen Prize winner, *Maurice Ewing—"Student of the Earth."* In accepting the Prize from Dr. Grayson Kirk, President of Columbia, Professor Ewing drew attention to the importance of team work on the part of his colleagues at Lamont in permitting him to continue as a research scientist by sharing administrative responsibilities.

On the following day Dr. Ewing presented the Vetlesen Lecture, *"The Mechanics of the Mid-Ocean Ridge and Rift"* before a group of invited scientists.

*(Continued on page 29)*

Among the scientists gathered to hear Professor Ewing's Vetlesen Lecture were (left to right) (seated) Professor Harry H. Hess, Princeton University; Professor Felix A. Vening-Meinesz, president of The Netherlands Geodetic Commission; Dr. Ewing; Miss Inge Lehmann, Copenhagen, Denmark; and Professor H. Mosby, Bergen, Norway. (standing) Professor Frank Press, California Institute of Technology; Dr. Weikko A. Heiskanan, Ohio State University; Dr. George Wuest, Professor Emeritus of Oceanography, University of Kiel; and Sir Edward Bullard, Cambridge, England.

In the receiving line at the reception preceding the presentation of the first Vetlesen prize to Professor Maurice Ewing were (left to right) Dr. Alan T. Waterman, director of the National Science Foundation; W. Barrett Brown, president of the G. Unger Vetlesen Foundation; Col. Bernt Balchen, noted Polar flier; Mrs. Ewing; Professor Ewing; and Dr. Grayson Kirk, President of Columbia University.

## Planetary Science Committee

Dr. Lloyd Berkner, President of the American Geophysical Union recently announced the appointment of a Planning Committee on Planetary Sciences in recognition of the growing activities of the AGU members in the area of planetary and space research.

Homer E. Newell, Jr. has been named Chairman of the Committee and Robert Jastrow will be secretary. Other members are Philip H. Abelson, Leroy R. Alldredge, J. W. Chamberlain, Thomas Gold, J. G. F. MacDonald, Hugh Odishaw, Allen Shapley, E. H. Vestine, Harry Wexler and Charles A. Whitten.

## Appalachian Institute

The Department of Geology, American University, in Washington, D. C., will conduct a conference on the *Stratigraphy and Structure of the Appalachians* for 40 college professors during the period June 8 through June 21, 1960 with the aid of a grant from the National Science Foundation. Following background lectures on the campus of American U., the participants will spend seven days in the field studying critical areas of the Appalachians.

Participating in the program as guest lecturers will be R. W. Fairbridge, Columbia University; E. H. Watson, Bryn Mawr College and H. P. Woodward, Rutgers University.

## Academic Year Institutes

In the academic year 1960-61 the National Science Foundation is sponsoring 33 academic year institutes in U. S. colleges and universities. 1600 science and math students will be selected to participate in these institutes as a part of the NSF's program to improve the abilities of science teachers.

Earth sciences will be included in the programs of 10 of the 33 institutes but none of the programs have departments of earth science (geology-geophysics) as their prime sponsors. The institutes offering earth sciences in their academic year institutes are as follows:

- *Iowa State Teachers College* (Cedar Falls)
- *Washington University* (St. Louis)
- *Syracuse University* (Syracuse)
- *University of North Carolina* (Chapel Hill)
- *Oklahoma State University* (Stillwater)
- *Oregon State College* (Corvallis)
- *Pennsylvania State University* (University Park)
- *South Dakota State University* (Vermillion)
- *University of Texas* (Austin)
- *University of Virginia* (Charlottesville)

**a progress report on the**

# Reorganization of AGI

**An interim report to the profession**
**by B. Warren Beebe, Chairman**
**AGI Reorganization Committee**

A 43-page report of the AGI Reorganization Committee Executive Group was completed March 8, 1969, and has been distributed to the broad membership of the AGI Reorganization Committee, the Officers and Directors of the Institute and ranking Officers of AGI Member Societies. The report includes a proposed charter, and a constitution and bylaws for an Institute of Geological Sciences, which is the recommended successor to the AGI to serve geophysics, geochemistry, paleontology and all branches of geology. Also included are two supplemental reports embracing statements and recommendations relative to general policy and to finances. Every effort will be made to seek early consideration and endorsement of the reorganization proposals.

In summary, the AGI Reorganization Committee Executive Group is recommending a broadly permissive constitution for a new Institute of Geological Sciences to be chartered independent of the present affiliation with the National Academy of Sciences–National Research Council. Specific recommendations are made for stable basic financing by the Member Societies through a uniform assessment formula and a new and stronger management structure. The new Institute envisioned by the Executive Group would continue to serve the geological scientists in the areas of education, public relations and government relations, but significantly greater emphasis would be placed on professional standards and other problems directly and indirectly related to improvement of scientific and professional stature.

The way to reorganization has not been smooth. It has been necessary to study diligently, weigh carefully and resolve widely divergent points of view expressed individually and collectively in various sectors of the profession. Tolerant awareness of these problems and constructive consideration of the proposed reorganization plans on the part of the Member Societies will be essential to the birth of a new, and more effective Institute.

The January-February 1960 issue of GeoTimes carried an article by AGI's president, Raymond C. Moore, raising the fundamental question in its title "Can AGI Survive?" In that article he delineated certain basic problems with regard to AGI's organization, management, finances, program and objectives which needed serious review and reorientation. President Moore reported the formation of the AGI Reorganization Committee in

## AGI REORGANIZATION COMMITTEE EXECUTIVE GROUP

J. Robert Berg, University of Wichita, Wichita, Kansas

George V. Cohee, U. S. Geological Survey, Washington 25, D. C.

Sigmund I. Hammer, Gulf Research & Development Co., Box 2038, Pittsburgh 30, Penn.

George C. Hardin, Jr., Michel T. Halbouty, 5111 Westheimer, Houston 27, Texas

William B. Heroy, Jr., The Geotechnical Corporation, Box 7166, Dallas, Texas

Noel H. Stearn, 128 Goya Road, Menlo Park, California.

B. Warren Beebe, Chairman, P. O. Box 667, Boulder, Colorado.

## *reorganization recommendations . . .*

The AGI Reorganization Committee, Executive Group has devoted nearly 200 man-days of concentrated effort to study, deliberation and development of specific suggestions for the reorganization of the AGI into a more sound organization to better serve the needs of the scientists in the areas of geology and solid earth geophysics.

Speaking of the efforts of the Executive Group of the Reorganization Committee and its Chairman B. Warren Beebe, AGI's President Moore has said, *"This labor by dedicated individuals was not purchasable, but has been generously contributed for the good of the profession."*

Some of the important recommendations proposed by the Executive Group are

- **a new name**

  INSTITUTE OF GEOLOGICAL SCIENCES

  Serving geophysics, geochemistry, paleontology and all branches of geology.

- **a new form of Government**

  Management representation by members of Member Societies would reflect the proportionate membership of the Member Societies.

- **provisions for certification**

  The new Institute would be empowered to establish and maintain necessary standards for certification of its qualified individual members.

- **financing by assessment**

  An assessment formula based on a percentage of dues of its members would be paid by each Member Society to provide basic financing of the Institute.

The recommendation are now being studied by the AGI Board of Directors and by appropriate governing bodies of the AGI Member Societies. Details are contained in the accompanying report by Chairman Beebe.

response to the vote of the AGI Board of Directors in November to appoint an "action committee" for the purpose of preparing specific proposals for reorganization of the Institute.

The AGI Reorganization Committee has been structured in three platoons. Immediately responsible for the shaping of the reorganization recommendation has been the AGI Reorganization Committee Executive Group. This group has received advice from and has reported to the broader membership of the AGI Reorganization Committee consisting of nearly 75 persons, mainly younger men chosen to provide profession-wide representation from all regions in North America. Similarly the Executive Group has had the counsel of an advisory "Cabinet' consisting of Past Presidents of AGI and members of special AGI study committees.

Appointment of the Executive Group of the Reorganization Committee was completed by President Moore before the end of November and by mid-December most of the larger membership of the Committee had been named.

The Chairman undertook as his first

assignment the preparation of a digest of all available data on AGI reorganization assembled by the Croneis Evaluation Committee and other groups studying AGI problems. The digest was completed and circulated to Committee members in late December. During this period detailed data on the organization and operation of numerous other scientific and professional groups was assembled. In the meantime the "attitude survey" reported in the March issue of GeoTimes (Vol. IV, No. 6, page 18) was conducted.

### Denver Meeting

Analysis of the materials assembled in this pre-meeting period focused attention on the critical problems of reorganization. When the Executive Group of the Reorganization Committee met in Denver on January 30-31, there was concentrated attention on these problems during the two-day meeting. In many instances the Group was faced with resolving wide differences of opinion and in some cases seemingly incompatible points of view expressed in various sectors of the profession by individuals, groups of individuals and Member Societies. A preliminary report of the deliberations and recommendations voted by the Executive Group at the Denver meeting was promptly completed and circulated to the full membership of the Reorganization Committee.

Needless to say the report carrying the preliminary recommendations proposed at the Denver meeting of the Executive Group, when it was attempting to steer the difficult course through the mass of conflicting views, produced a wide range of reactions among recipients. Some recipients were quite enthusiastic over the proposals, while others protested vigorously. The most controversial matter was that of the name. In Denver the Executive Group voted to submit the name Earth Science Institute for consideration of the Reorganization Committee in its preliminary report. Protests with regard to the name and some of the other preliminary proposals dictated reconsideration of these points when the Group next convened in Washington.

### Separation from Academy Explored

Between the Denver meeting of the Executive Group in late January and its next meeting in Washington in late February, each member was designated a task force assignment. During this period a financial and operational plan was pre-

*(Continued on page 33)*

# Committee of 1000 For AGI 1960

**Your contribution of $10 or more will enroll you in this committee, vital to AGI's existence**

The Institute has contributed to the advancement of the geosciences and geoscientists in many direct and indirect ways. in its eleven years of existance.

Few persons have stopped to realize, however, that AGI has accomplished its current level of performance under a constitution and by-laws which obligate no geoscientist or no Member Society to any degree of support of the Institute, so that in great measure it has had to shift for itself.

Your contribution of $10 or more will enroll you in the Committee of 1000 for AGI 1960 as a vote of confidence which can be translated into a better program to benefit you and your profession. *For your convenience, use the envelope in the center of the Jan.-Feb. issue of GeoTimes.*

## ARTHUR DAY DIES

Dr. Arthur L. Day, former head of the Geophysical Laboratory of the Carnegie Institution died on March 2, 1960 at the age of 90. He served as director of the Laboratory from 1907 when it was established until his retirement in 1936. From 1900 to 1906 he served on the staff of the U. S. G. S. He was also a vice president of the Corning Glass Company for many years.

Under his leadership the Geophysical Laboratory gained world-wide recognition for its research in investigation of the mineral systems, volcanic phenomena and diverse problems of experimental petrology. He contributed significantly to research on the manufacture of optical glass.

Dr. Day was a past president of the Geological Society of America and was active in many scientific societies and scientific affairs. From 1933 to 1941 he was a vice president of the National Academy of Sciences. The Day Gold Medal of GSA was established in his honor in 1947 and is awarded "for outstanding distinction contributing to geologic knowledge through application of physics and chemistry to the solution of geologic problems."

# COMMITTEE OF 1000 APPROACHES 500

## Recent Additions to the Committee of 1000 for AGI-1959

Ralph & Maxine Abbott
Joseph L. Adler
Curtis L. Amuedo
R. A. Baile
Mahlon M. Ball
R. S. Ballantyne, Jr.
Thomas D. Barber
Rachel M. Barker
Edward Barrett
John G. Barry
Charles C. Bates
C. Max Bauer
Frank R. Beck
Olin G. Bell
Sam G. Billings
L. D. Bonham
Charles C. Bradley
William C. Bradley
Lionel F. Brady
Andrew Brown
Walter C. Brown
J. J. Brummer
Arthur Brunton
L. S. Buckie, Jr.
William B. Bull
Robert W. Bybee
Frederic M. Chace
H. E. Christensen
J. B. Clark
J. T. Clark
Kenneth E. Clegg
John R. Coash
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John M. Colvin, Jr.
Fred W. Cook
Leavitt Corning, Jr.
Gilbert Corwin
Doak C. Cox
K. H. Crandall
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John F. Curran
Carle H. Dane
Edward C. Dapples
Paul S. Day
Fielding B. Dickson
R. V. Dietrich
George R. Ditsworth
James H. Donaway
Philip Donnerstag
Erling Dorf
Robert G. Doyle
George E. Dozier
L. J. Duersmith
R. W. Edmund
W. J. Edmund
John E. Elliott
T. Willard Espy
E. L. Estabrook
H. E. Eveland
Willard Farnham
James R. Fasbender
P. J. Fazio
M. M. Fidlar
Bill M. Fisher
A. L. Flagg
F. W. Floyd
Thomas W. Fluhr
Frank C. Foley
L. L. Fournier
John E. Frost
William M. Furnish
H. B. Fyffe, Jr.
V. G. Gabriel
Sidney S. Galpin
W. B. Gealy
George R. Gibson
G. B. Gierhart
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Andrew Gilmour
Waldo S. Glock
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Robert L. Gollnick
Edwin N. Goddard
Carlyle Gray
Jack Green
Robert R. Guilinger
K. Habicht
George F. Hanson
H. S. Hanson
George C. Hardin, Jr.
E. C. Hartman
H. E. Hawkes
James F. Hayes
Allan W. Hazard
Phil D. Helmig
Thos. A. Hendricks
William B. Heroy, Jr.
D. F. Hewett
E. Neal Hinrichs
S. W. Holmes
L. R. Hoxie
Keith M. Hussey
Marlene E. Hyde
Earl Ingerson
William P. Irwin
Charles C. Jefferson, Jr.
David E. Jensen
J. R. Jensen
S. E. Jerome
Frederic A. Johnson
Robert W. Karpinski
H. Allen Kelley
Owen Kingman
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Richard E. Kucera
Harry S. Ladd
Kenneth K. Landes
R. K. Lattimore
Glen W. Ledingham
Peter Lessing
Kurt E. Lowe
Wayne R. Lowell
John B. Lyons
Leslie E. Mack
J. N. Macomb, Jr.
Willis Jack Magathan
John F. Mann, Jr.
Don W. Mayhue
Conrad Martin
G. W. McGaha
E. D. McKee
Harold Metz
Howard A. Meyerhoff
Richard C. Mielenz
W. C. Miley
William B. Millar
Floyd H. Miller
Lloyd C. Miller
James D. Moffat, III
Watson H. Monroe
Frederick K. Morris
James L. Morris
Grace Muilenburg
John W. Mulford
G. Ernest Mulle
Siemon W. Muller
Roderick G. Murchison, Jr.
Fritz G. Nagel
H. K. Nason
T. W. Noon, Jr.
L. A. Norman, Jr.
Frank B. Notestein
K. B. Nowels
Ira D. Odgers
Robert E. Ostrander
Lincoln R. Page
Louis C. Pakiser, Jr.
John W. Parker
John F. Partridge, Jr.
Joseph M. Patterson
John B. Patton
Thomas G. Payne
Warren L. Peterson
Troy L. Pewe
Richard Phillips
William G. Pierce
Stanislaw J. Poborski
Howard A. Powers
William E. Price
Roy L. Pritchard
Willard P. Puffett
Fritz H. Putlitz
William C. Rasmussen
Robert B. Raup, Jr.
Frank Reeves
Jerome Regnier
Bert L. Renzetti
Robert E. Rettger
George S. Rev
James Richmond
W. J. Rieker, Jr.
Stephen Riess
Karl A. Riggs
William A. Riggs
Thomas F. Ritter
Claude M. Roberts
Hugh M. Roberts
Robinson and Roberts
Emile Rod
Sam Rosenblum
Clarence S. Ross
Clyde P. Ross
Howard E. Rothrock
R. Dana Russell
Raymond D. Sample
James J. Scardino
Sidney Schafer
Paul E. Schulz
Howard W. Scott
Berton J. Scull
Claude W. Shenkel, Jr.
Philip J. Shenon
Elgean Shield
James A. Shields
James W. Sheller
L. L. Sloss
G. E. Philip Smith
Ned M. Smith
Roger L. Spitznas
Wayne F. Stanford
Thomas E. Stephenson
John C. Stewart
John F. Stickel
Richard E. Sweet
R. L. Tabbert
Anthony J. Tamborello
E. Rowland Tragitt
Lloyd D. Traupe
Jonathan E. Taylor
Spence T. Taylor
Texas Seismograph Co., Inc.
Byron K. Thomas
L. O. Thompson
Richard C. Thompson
Aiji Vchiyama
Albert Voegeli
Wm. H. Vogelsang
Erik K. Waering
Warren R. Wagner
George E. Wagoner
Robert L. Wait
J. Lloyd Watkins
Douglas Weatherston
John Weitz
J. Marvin Weller
S. P. Welles
O. C. Wheeler
Richard D. White
Pat Wilde
Clark L. Wilson
H. A. Winkler
Virgil D. Winkler
C. E. Winn
Charles L. Winn
Kurt Wittges
H. H. Woodard
David H. Wozab
Sherwin M. Wylie, II
Frederick P. Young
W. Ford Young
Wilbur H. Young, Jr.
James H. Zumberge

*Previous list published in GeoTimes, March, 1960.*

# AAPG–SEPM

**Meet in Atlantic City,**

**April 23-25**

More than 2000 persons interested in petroleum geology will congregate in Atlantic City, New Jersey April 25-28 for the annual meeting of the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists according to Dr. Harry S. Ladd, General Chairman.

The meeting is expected to attract a greater than usual number of geologists from fields other than petroleum geology due to its Eastern Seaboard location. Student attendance is expected to be good.

Geologists from other parts of the country will have the opportunity to become acquainted with the geology of the Appalachians and the Coastal Plain–two potential areas for further petroleum development.

The technical program for AAPG has been developed under the guidance of Professor Francis J. Pettijohn and for SEPM by William J. Plumley. Among other sessions there will be a series of four papers on the Mohole Project.

Highlighting the social calendar will be the Hawaiian Luau that is scheduled as a "stag or drag" affair. The ladies program will include trips to historic Philadelphia and to Winterthur Museum of early Americana.

Once again exhibits representing recent technological innovations and improvements by the various oil industry service companies from coast to coast will be interestingly and attractively displayed at the annual meeting. Most of the Lounge Floor of the Haddon-Hall Hotel has been reserved for exhibit display and the usual well-patronized free coffee bars. Approximately 32 technical and 16 educational exhibits have been arranged. Sally Zippert, well-known Chicago caricature artist will be present through the courtesy of one of the exhibitors for six-hour periods from Monday through Wednesday. Everyone is invited to sit for one of Sally's humorous renditions. The educational exhibits will be interspersed among the technical exhibits and will depict timely and informative topics such as *"Climatic Zoning During the Geologic Past."* All in attendance at Atlantic City are urged to visit the exhibit area on Monday which has been designated as Exhibits Day.

Following the Atlantic City meeting there will be extension tours in Washington, D. C. to the Beach Erosion Control Board, U. S. Navy David Taylor Model Basin and U. S. Geological Survey, Topographic Division, Atlantic Region.

The activities of the meeting will draw to a close on Friday evening, April 29, when the "Mr. Bigs" of the AAPG-SEPM will be worked over by the lampooning buffoons of the famed Pick & Hammer Show staged especially for the visiting petroleum geologists.

In the Society of Economic Paleontologists and Mineralogists, Professor William R. Furnish of the University of Iowa will take office as President succeeding Samuel P. Ellison. L. L. Sloss will be the new vice-president; John Imbrie, secretary-treasurer; M. L. Thompson and Charles W. Collinson, co-editors of the Journal of Paleontology and Jack L. Hough, editor of the Journal of Sedimentary Paleontology.

The new president of AAPG will be Ben H. Parker, vice president of the Frontier Refining Company, who will succeed Lewis G. Weeks at the close of the meeting. Frank B. Conselman has been elected vice president; George Cohee, secretary-treasurer and Grover Murray will continue as editor of the Bulletin.

Named to honorary membership in the AAPG were Leonidas T. Barrow, Charles J. Hares, Roy T. Hazzard, Samuel H. Knight, Robert B. Moran and Edgar W. Owen.

The recipient of the Sidney Powers Memorial Medal, highest honor in petroleum geology, will be Henry V. Howe, Director of the School of Geology, Louisiana State University. Dr. Howe is recognized for his outstanding contributions through research in general geology, stratigraphy and micropaleontology of the Gulf Coastal Plain and for his role in building development of the LSU Department of Geology and the Louisiana State Geological Survey.

## CONGRESS corner

news and information on the

INTERNATIONAL GEOLOGICAL CONGRESS NORDEN

August 15-25 1960

The five Nordic nations who are to be hosts to the geologists of the World at the XXI International Geological Congress, Copenhagen, August 15-25, 1960 recently issued the Third Circular which has been sent to all who have officially registered for the Congress.

The Third Circular indicates that registration for attending members closed on February 1, 1960 but that non-attending members could still register prior to June 1, 1960.

Most field excursions are completed and booked with participants and all people who have applied for participation on excursions have been advised of the trip or trips to which they have been assigned. Trips A1, A39, A41 and C5 have been cancelled.

Group travel at reduced fares to and from excursion starting and termination points is being arranged for those who returned the completed form 6 before April 1.

The Third Circular announces the B-Excursions which are one-day excursions in the vicinity of Copenhagen:

GEOLOGICAL EXCURSIONS

B1. Aug. 20—Danian and Tertiary exposures south of Copenhagen; Karlstrup Cement Plant, Danian limestone; Lellinge, Paleocene silty clay; Stevns Klint, Senonian chalk and Danian limestone.

B.2 Aug. 21- Danian and Senonian exposures in eastern Sjaelland; Lellinge, Paleocene silty clay; Stevns Klint, Senonian Chalk and Danian limestone; Faxe, Danian Coral Reef limestone.

B3. Aug. 20—Glacial geology of Western Sjaelland and pre-historic dwelling place in the bog Aamose.

B4. Aug. 21—Glacial geology and geomorphology of Northwestern Sjaelland.

B5. Aug. 20—Ground water and water works in the Copenhagen-Roskilde area.

B6. Aug. 19—Visit to Kryolitselskabet Oresund, minerals from the Kryolite mine at Ivigtut, Greenland.

SIGHTSEEING TOURS

B7. Aug. 20—North Sjaelland: Helsingor and Kronborg Castle, Fredensborg Castle, Hilleröd and Frederiksborg Castle.

B8 Aug. 21—Southeastern Sjaelland: Köge, old city, Vallö Castle, Kliff of Stevns Klint, Rödvig, Gisselfeld Castle, Roskilde Cathedral.

B9 Aug. 21—Odense, where Hans Christian Andersen was born. Ferry over the Store Belt. Nyborg Castle, the castles of Hesselagergard and Ekeskov, the city of Odense, and back to Copenhagen.

B10 Aug. 22—Boat trip from Copenhagen through the northern part of the Oresund to Kullen north of Hälsingborg and back.

These trips will cost $5 to $12 each. No pre-Congress reservations are required for B-Excursions.

The Third Circular contains a proposal submitted by the National Contact Commissions of the Swiss and Dutch geologists, ". . . *to reconsider the desirability of establishing an International Geological Union.*" The British National Committee for Geology, organized under the Royal Society, to deal with congress matters has also submitted a *Proposal for the Formation of an International Union of Geology.*

The Society of Economic Geologists is planning a dinner for members of the Society and guests during the Congress. Information concerning this dinner will be published in the May-June issue of GeoTimes.

Professor R. V. Dietrich (Department of Geological Sciences, Virginia Polytechnic Institute, Blacksburg, Virginia), Professor K. R. Mehnert (Mineralogical Institute, Free University of Berlin), and Professor P. Michot (Institute of Geology, University of Liege) are preparing a correlated, three-language (English-French-German) list of terms and definitions pertaining to migmatites and associated rocks. This will be presented at the "Granite-Gneiss Problem" section of the Congress.

The preliminary compilation is complete. It contains nearly 100 terms, of which more than a third are not included in the A.G.I. Glossary of Geology and Related Sciences. Professor Dietrich will send the English version to anyone interested in making suggestions or criticising it. Requests should be sent to *R. V. Dietrich, Department of Geological Sciences, V.P.I., Blacksburg, Virginia.*

# GEOLOGY and the PUBLIC LIBRARY

By Walter Neustadt, Jr.

One of the most successful summer reading programs in its history was conducted by the Ardmore, Oklahoma Public Libraries in the summer of 1959. These reading programs are designed to attract children from the first grade and also to maintain enough interest for the high school student. In order to accomplish this the Ardmore Libraries for the past several years have used an incentive award system based on the number of books read and reported on during the summer.

Some of the past incentives have included feathers for Indian headdresses, flags representing state and national capitols, stars for space travel and even tails for kites. During the summer just ended and with the cooperation of the Ardmore Geological Society the incentive awards consisted of fossils, recent shells, rocks and minerals of various types and ages. Comparing the results of this year's program with those of past years and adjusting for some unusual circumstances several interesting features have come to light which point up the importance of using practical educational material rather than the purely symbolic ones of the past.

The slogan for the program this year was "Be An Earth Scientist; Collect Rocks, Fossils, Shells.", and it seemed to strike a responsive chord in students and adults alike. Despite the fact that the Ardmore Air Force Base was closed and all personnel transferred prior to the start of the summer reading program, the participation this year exceeded all past records. The following statistical examination of the past three years points up the big increase for 1959:

| | 1957 | 1958 | 1959 |
|---|---|---|---|
| Student Participation | 352 | 281 | 408 |
| Book Reports | 4,459 | 3,767 | 5,031 |
| Reading Certificates Issued | 133 | 148 | 212 |

Of especial importance is the fact that school enrollment was higher during both of the two previous years than it was during the 1958-1959 year. From a study of these figures it becomes apparent that the type of award must have provided a significant stimulus for active participation by an increased number of students as well as the increase in the number of books read. Both the Chief Librarian and Children's Librarian have presented this program on the basis of the individual rather than stressing competition between groups or other individuals; thus each student is competing only against himself and is not particularly concerned with the results achieved by anyone else.

The largest increase was seen in the older age group where awareness of scientific phenomena was the greatest. The Junior and Senior High School students who previously had felt the reading program was beneath their dignity or was too childish now decided that fossils, rocks and minerals were well worth the time and effort needed to win them. Parental interest this year was higher than ever before and became an even greater factor at the time the collections went on display toward the end of the summer. Both student and adult check-out of associated reading and reference material increased appreciably. There seems to have been no decrease in interest during the time following the close of the program. The source material is still being requested and there is in added call for new and more advanced texts, both from a technical and lay viewpoint.

Half of the cost of the program was underwritten by the Ardmore Geological Society, but the total cost would be within the means of even limited library budgets. Many members of the Geological Society reported a large increase in questions from both children and adults, especially in regard to areas available for further fossil and mineral collecting. Interest has also been shown in enlarging the small collections by purchases and trades. The present market would indicate that one good fossil specimen would bring two good mineral types. Many of the children are already planning to use their collections as the nucleus for their Science Fair exhibits next spring.

The geological material used was divided into three categories as follows:

FOSSILS

| | |
|---|---|
| Fossil Shark Tooth | Brachiopod |
| Crinoid Stem | Ammonite |
| Pelecypod (2) | Blastoid |
| Fossil Fern | Dinosaur Bone |
| Bryozoan | Dinosaur Gizzard Stone |
| Gastropod | Coral |
| Echinoid | Petrified Wood |
| Sponge | |

RECENT SHELLS

| | |
|---|---|
| Vermetus Spirata | Umbonium Gigantea |
| Oliva Pinderina | Star Limpet |
| O. Bulbosa | Pelican Foot Shell |
| O. Textelinna | Stripe Cone |
| Cyprea Serpentis | Sea Urchin Bone |
| C. Annulus | |

ROCKS AND MINERALS

| | |
|---|---|
| Obsidian | Apatite |
| Bornite | Quartz (Crystal) |
| Malachite | Quartz (Agate) |
| Calcite | Lepidolite |
| Barite Rose | Chrysocolla |
| Selenite | Pyrite |
| Turquoise | Muscovite |
| Chalcopyrite | Amethyst |
| Feldspar | |

**Robert H. Lyddan, Assistant Director (right), receives on behalf of the U. S. Geological Survey a plaque and the "Golden Anniversary Book of Scouting" from an Eagle Scout in recognition of "significant service to American Boyhood through Scouting" as Department of Interior and Scout officials look on.**

Each specimen was accompanied by a descriptive card giving the name of the specimen, the locality from which it was obtained and other data which could be of interest to the lay public. All items were obtained from Mr. Allen A. Graffham, Geological Enterprises, Box 926, Ardmore, Oklahoma.

The effectiveness of such a program would be greatly diminished without adequate reference material for the various age groups. A partial bibliography of such material in the Ardmore Public Library includes the following:


ABBOTT, R. T.: *Introducing sea shells.* 1955. Van Nostrand.

ANDREWS, R. C.: *All about dinosaurs.* 1953. Random House.

ANDREWS, R. C.: *All about strange beasts of the past.* 1956. Random House.

BLOCH, M. H.: *Dinosaurs.* 1955. Coward-McCann.

CAVANNA, BETTY: *The first book of sea shells.* 1948. Franklin Watts.

CORMACK, M. B.: *First book of stones.* 1950. Franklin Watts.

DITMARS, R. L.: *The book of prehistoric animals.* 1935. Lippincott.

DODGE, N. N. AND ZIM, H. S.: *American Southwest; a guide to the wide open spaces.* 1955. Simon and Schuster.

DUDLEY, R. H.: *Sea shells.* 1953. Crowell.

DUDLEY, R. H.: *My hobby is collecting sea shells and coral.* 1958. Hart.

EVANS, EVA: *Adventure book of shells.* 1955. Capitol.

EVANS, EVA: *Adventure book of shells.* 1955. Capitol.

FENTON, C. L.: *Prehistoric world; stories of animal life in past ages.* 1954. Day.

PODENDORF, ILLA.: *True book of rocks and minerals.* 1958. Children's Press.

FENTON, C. L.: *Rocks and their stories.* 1951. Doubleday.

FENTON, C. C.: *The fossil book.* 1958. Doubleday.

FRITZEN, D. K.: *The rock-hunter's manual.* 1959. Harper.

JENSEN, D. E.: *My hobby is collecting rocks and minerals.* 1955. Capitol.

PARKER, B. M.: *The golden book of science.* 1955. Simon and Schuster.

PARKER, B. M.: *Stories read from rocks.* Row, Peterson.

PEARL, R. M.: *How to know the minerals and rocks.* 1955. McGraw-Hill.

POUGH, F. H.: *Field Guide to rocks and minerals.* 1953. Houghton.

ROGERS, J. E.: *Shell books.* 1951. Bransford.

SCHEELE, W. E.: *Prehistoric animals.* 1954. World Publications.

SHUTTLESWORTH, D. E.: *Story of rocks.* 1956. Garden City.

SWINNERTON, H. H.: *The earth beneath us.* 1956. Little.

VERRILL, A. H.: *Shell collector's handbook.* 1950. Putman.

WHITE, A. T.: *All about our changing rocks.* 1955. Random House.


## GEOLOGY OF DENMARK

*(Continued from page 11)*

Before this little outline of the work of Danish geologists is terminated, attention should also be drawn to the study of the North Atlantic Tertiary Basalt Province, which occupies parts of West and East Greenland, Iceland, the Faroes and parts of Scotland. Fundamental studies have been carried out by Noe-Nygaard and his co-workers in the regions which are under Danish supremacy, and in Iceland.

### FUTURE PROBLEMS

If we finally look forward it is obvious that Danish geologists will be confronted with numerous problems to be solved in the future. In Denmark proper the masses of subsurface data have to be compiled to subsurface maps. Moreover, geo-hydrological maps have to be constructed since the water supply of Denmark is largely under the necessity of utilizing ground water, surface mapping has to be continued in order to meet the demand of construction, agriculture, etc. etc.

In case of Greenland the area to be surveyed is so large that probably more than 50 years are needed before the icefree land is thoroughly enough known.

The geological institutions of Denmark include: the Mineralogical-Geological Museum and Institute of the University of Copenhagen, the Geological Surveys of Denmark and Greenland, and a few other government institutions. The mining companies of Kryolitselskabet Oresund and Nordisk Mineselskab are the only companies, who have employed economic geologists.

The Geological Society of Denmark has about 430 members of which about 370 are Danes, and of these about 60 are working as professional geologists.

# AAPG Field Trip
## Research and Coordination Committee

Geological Field trips afford incomparable opportunities for thousands of geologists to meet together annually to study in an atmosphere of good fellowship the geologic interpretations in areas of new and classic interest. Guidebooks prepared in conjunction with these field trips often afford the most complete compilation of current data available on the area and thus are an invaluable adjunct to the geologic literature.

The American Association of Petroleum Geologists, in recognition of the importance of field trips to the advancement of geologic knowledge, established in 1956 a Field Trip Research and Coordination Committee with the following objectives:

1. To help promulgate field conferences and aid in sale of guidebooks through publication of periodical listings of forthcoming conferences.

2. To help coordinate field conferences by notifying organizations of conflicting dates or areas where adjoining interests are affected.

3. To coordinate and aid the efforts of local geological organizations on a national level.

4. To aid in maintaining high standards of guidebook publications and field conference organizations.

To aid in field trip planning and coordination the Committee published an article, *Field Conference Organization, (Bulletin, AAPG, vol. 43, no. 8, pp. 1978-1990, August 1959).* The articles provide detailed suggestions on the methods of organizing committees for planning and operations of field conferences of various sizes and purposes. The many varied and sometimes overlapping duties of each committeeman are outlined. Discussed are the duties of the General Chairman, Vice-Chairman and the Conference Staff consisting of the Conference Leader, the Treasurer and those handling the program, road logs, reservations, registration, publcity, traffic control, busguides, and special services. The important role of the Guidebook Editor and the editorial staff consisting of editorial associates, illustration editors, advertising editor and road log editors is also discussed.

The various ways in which field trips can be successfully planned and conducted are discussed. The importance and the lasting value of the guidebook is stressed. Throughout the article are suggestions and pitfalls to be avoided.

The importance of pre-conference announcements in scientific and trade journals is stressed as a means of stimulating attendance and guidebook sales.

The AAPG Field Trip Research and Coordination Committee serves to coordinate field trip scheduling to avoid conflicts and regularly publishes a *"List of Forthcoming Field Trips in the United States and Canada"* in the March and August issues of the AAPG bulletin and cooperates in supplying field excursion data for the GeoTimes calendar. It should be noted in passing that Abstracts of guidebooks are regularly published as received in *Section 1 of GeoScience Abstracts,* published monthly by the American Geological Institute as a means of making permanent bibliographic reference to these important publications.

The committee recognizes the importance of field trip notices and publicity in the trade journals of industry in emphasizing the role of the geologist and in furthering management approval of field trips. Negotiations are under way for regular coverage of important field conferences in one of the leading trade journals.

### AAPG Field Trip

**Research and Coordination Committee**

**L. B. Culligan,** Jackson, Miss.
**Samuel P. Ellison,** Austin, Texas
**John J. Gill,** Lubbock, Texas
**Herbert D. Hadley,** Billings, Montana
**Curtis J. Little,** Alburquerque, N. M.
**Daniel F .Merriam,** Lawrence, Kansas
**Steven S. Oriel,** Denver, Colorado
**Robert H. Pascall,** Ventura, California
**Howard R. Ritzma,** Denver, Colorado
**E. E. Rue,** Mount Vernon, Illinois
**F. B. Van Houten,** Princeton, New Jersey
**George H. Fentress,** Chairman, P. O. Box 2585, Denver 1, Colorado

Reprints of Field Conference Organization may be obtained by any local geological society or field conference chairman upon request from the chairman or the regional committeeman listed above.

## A Report on

# International Geology Review

## and Other Aspects of the AGI Translations Program

The AGI translations program was first announced in GeoTimes in October 1958. Since then there has been established a new journal, *International Geology Review;* regular publication in English of the *Izvestiya of the Academy of Sciences of the U.S.S.R., Geologic Series,* has begun and the AGI program has been given the responsibility of continuing the publication of the earth sciences sections of the *Doklady of the Academy of Sciences of the U.S.S.R.* Since the program was started there has been a change in location of headquarters from New York to Washington, D. C. and changes have been made in the organizational structure. The delegation of responsibilities is shown in the accompanying organization chart.

Overall responsibility for the translations program is vested in the Executive Committee of the American Geological Institute guided by the recommendations of the AGI Advisory Committee on Translations in liaison with the National Science Foundation and other organizations. The members of the Translations Committee are drawn from industry, government, and education and their interests cover such diverse fields as paleontology, stratigraphy, geophysics, geochemistry, economic geology, meteoritics, nuclear geology, and military geology.

It is the responsibility of the Translations Office to provide staff support and to implement the recommendations of the Translations Committee. Early in 1959, the office was moved from New York City to Washington, and in July 1959 Thomas F. Rafter, Jr., joined the staff as manager.

In the following months, an agreement was made with Consultants Bureau of New York to translate and process the *Doklady of the Academy of Sciences of the U.S.S.R., Earth Sciences Sections.* Another was made with International Division of Royer and Roger to furnish translations of the *Izvestiya of the Academy of Sciences of the U.S.S.R., Geologic Series,* and to complete translation of V. V. Beloussov's book *Fundamental Problems in Tectonics.*

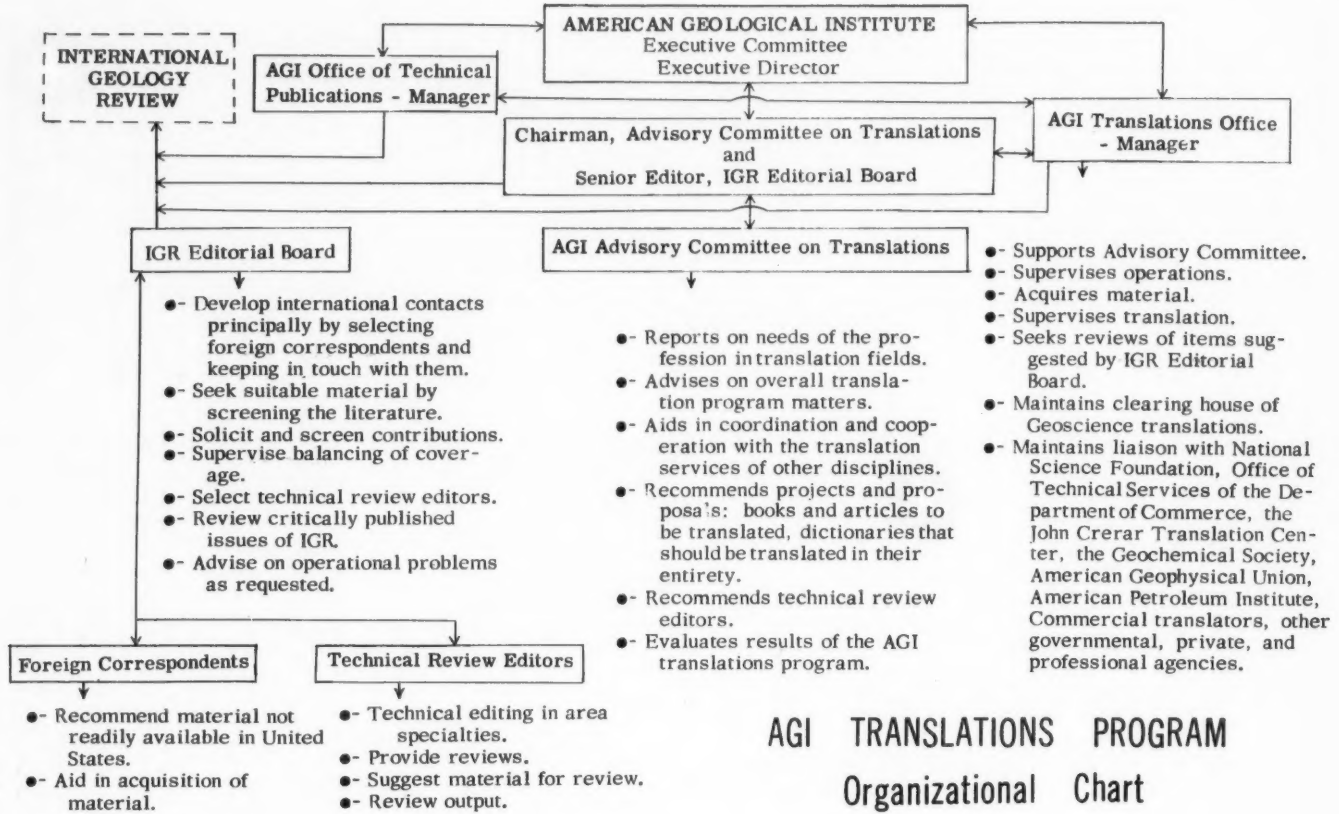
Much of the effort of the Translations Office has been devoted to acquiring material for *International Geology Review.* Cooperative arrangements for translating have been sought with various groups. *International Geology Review* was established for the purpose of reporting in English significant contributions to pure and applied research in the geological sciences which have appeared in foreign language journals. Primary emphasis has been on Russian, but material from the Chinese, Japanese, and other difficult languages is actively sought. A feature of the final issue of each volume is author and subject indexes for the year.

The editorial policy of *International Geology Review* is determined by a board of four editors consisting of Earl Ingerson, Senior Editor, Thomas S. Lovering, Siemon W. Muller, and James J. Roark. A high level of technical review has been assured through the aid of Donald B. McIntyre, William B. Heroy, Jr., C. Osborne Hutton, S. Altschuler, Dan A. Davis and others as review editors. Assistance is given the Translation Committee in screening the literature for potential material by Maxim M. Elias, Michael Fleischer, and V. Peter Sokoloff.

In the first twelve issues (Volume 1, 1959) *International Geology Review* published 76 translated papers, 17 book and subject reviews, and 11 summaries and notes on international scientific meetings. How these 104 feature items were distributed among the major geologic fields is shown in the following summary:

| Major Field | No. of Items |
|---|---|
| Structural Geology | 14 |
| Stratigraphy & Historical Geology | 14 |
| Fuels | 14 |
| Areal & Regional Geology | 11 |
| Geochemistry | 10 |
| Sedimentary Petrology | 10 |
| Mineral Deposits | 9 |
| Geophysics | 6 |
| Geohydrology | 4 |
| Geomorphology | 2 |
| Paleontology | 2 |
| Igneous & Metamorphic Petrology | 2 |
| Mineralogy & Crystallography | 1 |
| Miscellaneous | 5 |
| Total | 104 |

To a great extent the coverage of IGR has been and will continue to be governed by the areas of scientific interest of those




AGI TRANSLATIONS PROGRAM
Organizational Chart

## AGI Advisory Committee on Translations

**Earl Ingerson,** Chairman, University of Texas

**Eugene A. Alexandrov,** Columbia University

**James W. Clarke,** U .S. Geological Survey

**Dean F. Frasche,** Union Carbide Company

**Alexander Gakner,** U. S. Bureau of Mines

**John K. Hartsock,** Atomic Energy Commission

**Henry Hotchkiss,** Standard Oil Co. of N. J.

**Kurt E. Lowe,** College of City of N. Y.

**Brian Mason,** American Museum of Nat. Hist.

**John Rodgers,** Yale University

**Frank C. Whitmore, Jr.,** U. S. Geological Survey

scientists who are active in and interested in the journal and the overall translation program.

The AGI Translations Program was undertaken for the purpose of more widely disseminating the results of foreign research to American geologists. In order to critically evaluate the program, learn of needed changes, and make it more effective the active participation and cooperation of the entire profession is needed. You are invited to send comments, criticisms, and offers of assistance to *Earl Ingerson, University of Texas, Austin, Texas, or; Translations Office, American Geological Institute, 2101 Constitution Avenue, N.W., Washington 25, D. C.*

## AGI LONG RANGE CALENDAR

The AGI Long Range Calendar of North American and foreign meetings of interest to geoscientists appeared on pages 27-28 of GeoTimes, March 1960.

This calendar, giving advanced notices of meetings scheduled, will be published twice each year—Spring and Fall.

Notices for this calendar should be sent to **Mrs. Kathryn Lohman ,GeoTimes Calendar Editor, 2101 Constitution Ave., N.W., Washington 25, D. C.**

## ESTUARY AND COASTLINE CONFERENCE

**Sponsored by MIT, June 20-July 1, 1960**

A special summer program on ESTUARY AND COASTLINE HYDRODYNAMICS will be sponsored on the campus of the Massachusetts Institute of Technology, June 20-July 1, by the Department of Civil and Sanitary Engineering.

This two-week program is intended to meet the needs of engineers engaged in the design and development of all types of marine structures in which gravity wave action and tidal phenomena are important. A general and concise review of the theory will be given including the most recent results of experimental and analytical research. Topics include: generation and transformation of waves, damping by boundary layer action, wave refraction and diffraction, resonant conditions in harbors, interaction of waves and marine structures, coastal currents, sediment erosion and deposition, tidal dynamics of estuaries and inlets, saline and fresh water interaction, steady and unsteady diffusion processes in estuaries, coastal and tidal models. The lectures will be given by staff of the Hydrodynamics Laboratory of the Department of Civil and Sanitary Engineering and will be coordinated with presentations by other distinguished experts in the field. Dr. Arthur T. Ippen, Professor of Hydrau--lics, will be in charge of the program.

**VETLESEN PRIZE** *(Cont. from page 16)*

The visiting scientists took part in the discussion session which followed.

Dr. Ewing has received numerous other honors in addition to the Vetlesen Prize. Among them are the Day Medal of the Geological Society of America, the Agassiz Medal of the National Academy of Sciences, the Order of Naval Merit of the Republic of Argentina with the rank of Commander, and the Distinguished Public Service Award of the U. S. Navy.

Georg Unger Vetlesen was a native of Oslo, Norway, but came to the United States first in 1916. He was a graduate in naval architecture and mechanical engineering from the Imperial Institute of London. During his career he was engaged in shipbuilding, associated with the U. S. company representing the Norwegian American Line, and was one of the founders of S.A.S. in the United States among many other activities. He became a U. S. citizen during World War II and served as a member of General Eisenhower's Special Forces Headquarters staff.

# WHAT IS A GEOCHEMIST?

By

RAMON E. BISQUE [1]

In the past few decades several definitions of geochemistry have been put forth. Clarke, in *The Data of Geochemistry* defined it as follows:

*Each rock may be regarded, for present purposes, as a chemical system in which, by various agencies, chemical changes can be brought about. Every such change implies a disturbance of equilibrium, with the ultimate formation of a new system, which, under the new conditions, is itself stable in turn. The study of these changes is the province of geochemistry. . . .*

Fersman in his book on the geochemistry of Russia in 1922 described geochemistry:

*. . . geochemistry studies the history of chemical elements in the earth's crust and their behavior under different thermodynamic and physico-chemical natural conditions.*

More recently V. M. Goldschmidt described Geochemistry as follows:

*The primary purpose of geochemistry is on the one hand to determine quantitatively the composition of the earth and its parts, and on the other to discover the laws which control the distribution of the individual elements. . . .*

The adequacy of these definitions is debatable and difficult to demonstrate. A more practical controversy arises however in considering the definition of a geochemist. In the latter case we are dealing with the qualifications of an individual. This is the problem now confronting our colleges and universities which are being pressed into offering degrees in geochemistry. The fact that we recognize and define "geochemistry" does not inherently imply that we must recognize and define a geochemist as well. Is there a need for such a character? Cannot the chemist solve all of the chemical problems of the geologist and vice versa? To answer this we might consider the following questions which are but a few illustrative examples of dozens which might be posed.

Is the average chemist adequately trained to "think to scale" when pondering geologic phenomena? Does the average geologist have a working appreciation of the basic chemical laws manifest in the minerals which comprise the rocks with which he works? Is the average paleontologist capable of investigating the types of complex organic reactions which have given him such a variety of subjects? Is the average chemist able to apply his chemistry to chemical prospecting techniques without an understanding of rock types, weathering, soil formation, etc.?

If a geochemist is to be the answer to any or all of these predicaments, we may well ask again "What is he." Is he a compromise between a good chemist and a good geologist, a half breed of a sort? Is he a geologist with an interest in chemistry or vice versa? Is he a specialist in things which are out of the ordinary realm of geology and chemistry but related to both fields?

In the utilitarian sense we could discuss the geochemist at the various academic levels. There might be some doubt as to whether a geochemist can be trained during the four year period ordinarily required for the B.S. degree. A major course of study in either chemistry or geology with a strong minor in the other field would certainly prepare the graduate for work toward the M.S. degree in geochemistry.

Here, in the graduate program, the problem crystallizes. If the student has majored in geology, how much chemistry should be required to qualify him for an M.S. in geochemistry? It is doubtful whether any school in this country offers enough courses in geochemistry to eliminate this problem, in fact it is questionable as to whether this would be desirable. Should the student continue his geologic studies to qualify for the M.S. degree in geology and at the same time fulfill the minimum requirements for the B.S. degree in chemistry? This would ordinarily necessitate a prolonged course of study. Should he be given a diluted program in geology to enable him to pursue his chemistry studies further? Similar questions might be asked concerning the chemistry graduate who has minored in geology and is seeking a similar degree.

The solution, it seems, depends on the functioning of well chosen graduate committees consisting of informed geology and chemistry instructors who are willing to consider the student's unique interest and compromise. Compromise not to the point of being lax in either field, but to formulate a program which strikes a suitable balance between the two disciplines and offers an opportunity for the necessary integration of ideas. The requirement of original research

*(Continued on page 43)*

[1] DR. RAMON E. BISQUE, Assistant Professor of Chemistry, Colorado School of Mines, received his Ph.D. in Geology-Chemistry from Iowa State University in 1959.

# Impact of Russian Mineral Production on the U. S. and the Free World

Currently Russia is reported to be producing about 16 percent (in value) of the world's total in mineral products (U.S. about 30 percent). The Sino-Soviet communist bloc of nations is considered to be virtually self-sufficient in minerals. In addition, the Soviet Union itself is exporting a variety of mineral products in increasing quantities, and has now become a significant competitor in some international markets. Thus, the Soviet has come from a position of many shortages to one of moderate to substantial surpluses in many mineral commodities, some of which are being sold in free world markets. In this connection, it should be recognized that the framework of the Communist Council for Mutual Economic Aid requires rapid expansion of Soviet minerals production, without regard to immediate economic soundness of this production.

Regarding exports of minerals from Russia, in 1958 it supplied the major share of its European satellites iron ore requirements, together with some exports elsewhere (Austria). There were also exports of manganese ore, chrome, zinc, asbestos, alumina, apatite concentrates, and potash. There were, however, imports in tungsten, molybdenum, bismuth, vanadium, uranium and some non-ferrous concentrates.

In coal, Russia produced in 1958, 529 million tons, as compared with 405 million in the U.S. (U.S. all time high 636 million tons in 1947).

Apparently Russia is unifying a plan to use to her fullest possible advantage her natural energy fuels, and this accounts for the rapid development of her coal industry (in balance with her use of petroleum and natural gas resources). In this respect, the U.S. seems to lack at present an equivalent national policy toward the utilization of our energy fuels in the most beneficial long term interests.

Without any attempt to itemize or specify various Soviet activities in the sphere of mineral production, it may be generalized that while Russia is still well behind the U.S.A. in the total production of most mineral products and still further behind in the exportation of such minerals worldwide, the ratio of increase over the U.S.A. is significant each year and may be expected to be more so in the 1960's and thereafter.

The effort on the part of the Soviet government in this respect is apparent. Thus, it is reported that the Soviet Union is now employing about 40,000 geologists in the search or study of mineral resources as compared with a total of about one-half this number in all U.S. government, industry and college employment.

The number and quality of current Russian technical papers on various aspects of mining and mineral technology is impressive. Of still greater significance is the surprising number of Russian publications in the basic sciences pertaining to the mineral industries (mineralogy, geophysics, geochemistry, etc.). The number of students being trained in Russia in mining engineering and in the earth sciences appears to be well ahead of those of the U.S.A. and perhaps above that of the combined free world nations. Thus, it appears that Russia's national mineral policy is tied in directly with its avowed policy of world domination. Also that the Soviet fully recognizes the importance of mineral resources and production capacity of mineral products, in the economy of any nation striving for world dominance.

Now there is no apparent way we can stop the Russian approach to parity with the U.S. production of mineral raw materials and finished mineral products. But a national standstill or retrogression in our mineral industries could accelerate the rate of approach by Russia. Equally apparent is the fact that deceleration of relative Russian importance can result from American aggressiveness and progress.

This is not confined to the immediate future, nor for the next ten years. It concerns the longer term future, wherein the development and conservation of reserves, depletion of mineral resources in accord with an economical and technically sound plan, and the most effective use of minerals (with consideration of recovery and re-use of mineral values) are all given due consideration.

There is another matter of concern in the Russian mineral industry picture. This is the production and exportation by Russia of mining and mineral processing equipment and machinery. There is an impor-

[1] Excerpted from a review and forecast by Dr. A. B. Cummins, President of the Society of Mining Engineers, AIME. Dr. Cummins is Manager, Mineral and Basic Research, Johns-Manville Research Corp., Manville, N. J. (AIME meeting, New York, Feb. 1960).

tant worldwide market in this field. It seems doubtful if much Russian mining equipment could be sold in the near future in the U.S., but perhaps it could be in foreign markets which are important to U.S. equipment manufacturers. It seems doubtful if exported Russian equipment at this time can compete with U.S. equipment on a quality and performance basis, but what about comparative prices and what may we expect in future?

In summary, we must recognize that Russia has become and will continue to become an increasingly important factor in the worldwide economy of minerals. There is no need for undue alarm about this situation. The U.S.A. and the free world have great mineral resources, which if wisely used and conserved will maintain our position of self-sufficiency or domination. To achieve this position, however, calls for immediate and wise action by the American mining industry, the government and the public. It is a challenge to the mining industry and to the legislatures of our country to handle its affairs, short term and long term, so that our mineral resources are best utilized in the broad interests of national and international welfare. That this can be done is positively certain, and it is an obligation of the mining engineering profession to see that it is done.



## Florida Field Trip

**May 6-7**

**Gainesville**

The Southeastern Geological Society will hold its 9th Field Trip in Central Florida on May 6 and May 7, 1960. The Field Trip will be conducted to some classic outcrops of Crystal River formation, Hawthorn formation, Alachua formation, Bone Valley formation, unnamed coarse clastics, and Pleistocene. The Field Trip will start from Gainesville, Florida, at 8:00 a.m., May 6 and will disperse in the vicinity of Bartow in the afternoon of May 7. Transportation will be by private car and the Society will furnish transportation to persons who so desire. The Field Trip will be led by E. W. Bishop and E. C. Pirkle; H. K. Brooks will act as commentator.

Registration, including 2 lunches, drinks and a Guidebook, will be $10.00. Student registration will be $3.00 and will include only a copy of the Guidebook.

This Field Trip will be by *pre-registration only* and persons interested in attending this Field Trip should write to the *Southeastern Geological Society, P. O. Box 841, Tallahassee, Florida, not later than April 29.*

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## OIL FROM BLUE HAZE

Dr. Fritz W. Went of the Missouri Botanical Garden, St. Louis writing in a recent issue of the Proceedings of the National Academy of Sciences advanced the hypothesis that the blue haze over the world's vegatated areas is actually petroleum in the process of forming. He attributes the haze to hundreds of millions of tons of volatile hydrocarbons and near-hydrocarbons released by plants into the atmosphere each year. These condense, Dr. Went believes, into small asphaltic or bituminous particles through a condensation process dependent upon ultra violet light in the presence of nitrogen oxides.

The title and reference of the article are as follows: *Organic Matter in the Atmosphere and Its Possible Relation to Petroleum Formation,* Proceedings of the National Academy of Sciences, vol. 46, no. 2, pp. 212-221. Single issues of the Proceedings may be purchased for $1.50 from the *Publications Office, NAS-NRC, 2101 Constitution Ave., N.W., Washington 21, D. C.*

## AGI REORGANIZATION REPORT

*(Continued from page 20)*

pared and drafts of a new constitution and bylaws were prepared. In this interval, the attitude of the National Academy of Sciences-National Research Council with regard to the financial and legal separation of the Institute from the Academy was sought. The Academy expressed its sympathetic understanding of the objectives of the reorganization and instructed its executive offices to aid in all possible ways the considerations of the Reorganization Committee.

### Washington Meeting

The first order of business when the Executive Group reconvened in Washington on Saturday, February 27, was to review, discuss and resolve the differences of opinion voiced by the Reorganization Committee. Out of deference to non-U. S. members of the Member Societies, it was concluded that American should be dropped from the name. Institute of Geological Sciences was adopted as the name to be recommended after long deliberation as to the inter-relationships of solid earth geophysics, geochemistry and other branches of geology. It has been further recommended by the Committee that the name, when displayed in print, should be accompanied by a second line which should read *"serving geophysics, geochemistry, paleontology and all branches of geology."*

After resolving the problem of the name and other basic problems of lesser importance the Executive Group spent the next four days—Sunday through Wednesday—working on the Constitution and Bylaws. During this period the Group worked closely with the Academy attorney, Mr. Arthur B. Hanson, to insure the legal correctness of these documents and to insure proper provisions for the most favorable considerations as a tax-exempt organization. The charter of incorporation and the constitution are broadly permissive documents. Seven classes of membership are spelled out in the constitution. These are Member Society, Associate Society, Affiliate Society, Student Society, Corporate Associate, Contributor and Individual Member. Individuals would hold membership only by virtue of membership in a Member Society or by option as a member of an Associate Society.

An advisory council would review broad policy matters and elect the Board of Directors which would be responsible for the operation of the Institute if the suggestions of the Executive Group are followed. They would also elect the officers of the Institute. Each Member Society would be entitled to appoint one or more members to the council based on the size of the society. Provisions are made also for electing councilors-at-large from nominations made by Affiliate Societies.

The Board of Directors would consist of members elected by the council. It would consist of not less than two members of each of the three largest Member Societies. Both the Board of Directors and the Council, therefore, would be organized to give greater representation of the membership of Member Societies.

### Certification

Article VI of the proposed constitution deals with certification and reads as follows: *The Institute shall establish and maintain standards of education, training and experience for the purpose of certifying its qualified Individual Members; further it shall establish and insure adherence to high standards of ethical professional conduct by its certified members.* Only those holding membership in a Member Society or an Associate Society would be eligible for certification. Certification would not be mandatory.

It is intended that the professional standards committee shall recommend to the Board of Directors of the new Institute the basis for certification of qualified Individual Members of the Institute. The Board would in turn present to the Council for its action the ways and means for establishing and maintaining a roster of certified scientists in the fields of geophysics, geochemistry and paleontology and all branches of geology.

### New Basis for Financing

It is proposed that the basic financial support of the Institute shall be derived from an annual assessment equal to 10 per cent of the annual dues collected by each Member Society from its members. It is recognized by the group that such a method of collection will involve multiple assessment of those who hold membership in more than one Member Society, but the collection costs on any system which would alleviate such duplication would be excessive and burdensome to Member Societies. In passing it should be noted that this proposed method is identical to that used by the physicists and similar to one recently adopted by the biologists.

The assessments would provide 20-30 per cent of the basic money needed to

operate the Institute. Associate, Affiliate, and Student Societies would pay very nominal annual dues and their members could, at their own option, subscribe to GeoTimes and other AGI publications at member rates. A new scale of Corporate Associates membership dues have been suggested. This would relate to the number of geological scientists employed by the Associate.

A change in format of GeoTimes to 8″ x 11″ has been proposed. This size is that of a large portion of the trade journals and it is believed that an increase in advertising would result from such a move.

Severence from the NAS-NRC would mean that overhead now paid to the Academy by the Institute would no longer be paid, and that the Institute would assume responsibility for services now provided by the Academy out of overhead funds.

### Possible Time Schedule

If adopted, how long would it take to activate the reorganized operation? It has been suggested the new organization can be chartered as soon as the new Institute of Geological Sciences and its constitution are approved by the major Member Societies. There would be a transition period during which the AGI operating under the NAS-NRC would transfer its operations to the newly-chartered IGS. At the end of this period the AGI would be dissolved as an office of the Academy and the new Institute would assume full responsibilities for the activities formerly conducted by the AGI.

Obviously, to endorse the new constitution and bylaws of the new Institute of Geological Sciences, the governing bodies will need to be thoroughly briefed on the study and discussions by the Executive Group of the Reorganization Committee. Although much of this background is contained in the 43-page report, plans are being made for personal conferences on the reorganization with representatives of the governing bodies of the AGI Member Societies during the coming months. It appears likely that the new Institute if approved without undue delay might assume full responsibility of operations by mid-1961.

The findings of the Croneis Committee and the various independent evaluation groups all indicated a unanimous recognition of the need by our profession for services of the nature being performed by AGI or envisioned in its future. With few exceptions the profession has come to the conclusion that these services can best be performed by a federation, such as AGI, working for the good of the Member Societies and their members. It is essential, therefore, that a means be found to reorganize the Institute on a sound, effective basis. The adoption by the Member Societies of the carefully considered recommendations of the Reorganization Committee would afford this means.

## Glaciological Notes

**a new bulletin established to report IGY data**

The first number of a new quarterly information bulletin, *Glaciological Notes*, was issued in January 1960 by IGY World Data Center A: Glaciology. The bulletin will contain news of professional interest to scientists who are concerned with the study of glaciers and the processes of glaciation, and, to a more limited extent, with related aspects of such fields as geology, geodesy, and climatology. It is hoped in this way to increase the exchange of glaciological information in the United States and with foreign glaciologists, and to encourage students who may be considering professional activity in this field. At the same time, *Glaciological Notes* will make more widely known the operations and collections of the Data Center.

The contents will include such items as information about recent and future meetings, positions available, research opportunities, recent translations of foreign glaciological publications, the quarterly accessions list of the Data Center's library, news of current and planned field and research activities, and occasional special reports. The active participation of its readers in contributing suggestions and appropriate information items will, of course, be an essential element in making *Glaciological Notes* a useful publication.

The four numbers to be issued in 1960 are being distributed free of charge. A limited supply is still available of No. 1 and of an accompanying supplement describing some of the glaciological activities carried out in 1959. Requests for these and subsequent issues should be addressed to *IGY World Data Center A: Glaciology, American Geographical Society, Broadway at 156th Street, New York 32, N. Y.*


DEAR SIR:

In the January-February 1960 number of GeoTimes you have an article on "Depletion: by Thomas C. Hiestand."

The investment in oil and gas in a producing lease is a "Capital Asset." It is measured by the amount invested in the lease, and may consist of a cost of lease, a bonus, exploration expenditures, drilling, etc. The "capital investment" is distinctly not the value of the oil and gas when mined, and it is recoverable through "cost" depletion or through "percentage depletion" whichever is higher.

At no time in the Law or in the regulations or in the various court decisions has depletion been called "return of capital." The Courts have called "depletion" "an act of grace by Congress." Cost or percentage depletion is allowed on "gross income" which has been designated by the Courts, by Congress, and by the Internal Revenue Service as "ordinary income" and not as capital income.

It follows that Mr. Hiestand is in error in saying there is a "total shortage in Capital Loss" in 1955 of $694,455,960. If there were, the many brilliant tax lawyers and accountants in the oil fields would have seen it long ago.

FRANK H. MADISON
Mineral Tax Consultant

DEAR EDITOR:

I read with much interest your article on "F. V. Hayden's Earthquake Camp" in the last issue of *GeoTimes*. There was a quotation from Hayden which interested me very much. The particular portion I refer to is as follows: "We were informed by mountain-men that these earthquake shocks are not uncommon, and at some seasons of the year very severe, and this fact is given by the Indians as the reason why they seldom or never visit that portion of the country."

I suspect we have finally tracked down the origin of the idea that the Indians avoided Yellowstone Park. I have wondered for a long time where this myth was originated. I say myth because the abundance of camp sites, tepee rings, obsidian chips, arrow heads, and so forth all over Yellowstone Park would seem to me to be ample testimony that the Indians far from avoiding the place must have used it frequently; and since many Indian tribes are addicted to some version of the steam bath or sweat bath they may have well used the Park in this connection as a recreation spot.

I might say in connection with artifacts, last summer I discovered a handful of very crude artifacts on an old beach line of Yellowstone Lake approximately 30 feet above the present lake level and in circumstances pointing to the high probability that the camp site had been pitched on the shores of the old lake. Not only have the Indians made ample use of the Yellowstone Park area but I would say the indications are they have used it for a long time.

Sincerely yours,
CHARLES C. BRADLEY, *Dean*
Division of Letters and Science,
Montana State College

TOO ALL AREA GEOLOGISTS AND FANS:

Since it is your hobby to read my writings, a few words may be in order, right from the horse's mouth.

All men make mistakes. I am no exception. But I can blame all my errors on one or all of the following:

*My teacher,* for my lousy hand writing which our beautiful secretaries cannot decipher;

*Antique typewriters,* for striking commas instead of Collins and making single words into hyphenated ones;

*The King,* (George VI), for poor grammar, since I learnt King's English as a Foreign language. I have since mastered Eisenhour English, but I have not used it intensionally because it is rather hard for a soft science like geology.

*My style,* for awkward sentences; they are intended to make you think and light up a "Marlboro" before you read them over and over and over again.

*Our editor,* for making illegible paragraphs out of otherwise legible material.

*Indians,* for their lack of foresight in their interjection of long Indian names into our vocabulary which we could neither pronounce nor spell.

*Our competent draftsman and his pretty girl Friday,* for printing 1/10 inch high words too close for comfort. I thought everybody knew how to read fused letters only by their length. How could I know you had missed a Visual Aid Course?

This takes care of errors of commission, for which I have just accepted all responsi-

# MANPOWER *in a column —*

By HOWARD A. MEYERHOFF
*Scientific Manpower Commission*
*1507 M Street, N.W., Washington 5, D. C.*

The Women's Bureau of the Department of Labor, in a recently published pamphlet on "Careers for Women in the Physical Sciences," says, rather hopefully, "One of the reasons for the strength and growth of the United States is its wealth of mineral and fuel deposits. A geologist is a specialist in the search for these raw materials and, therefore, plays a fundamental role in advancing our industrial economy."

Somewhat more cautiously, the new Occupational Outlook Handbook—1959 Edition, also issued by the Department of Labor, states that "employment opportunities for geologists with master's and doctor's degrees are expected to be good through the early 1960's. Geologists with only the bachelor's degree, however, will probably encounter heavy competition for professional positions."

There is no contradiction in these two statements, but it will take a transitional sentence or two to reconcile them. First of all, the business of finding new reserves of mineral raw materials is becoming an exact science. It is no longer enough to be able to identify 125 common minerals, 300 index fossils, and 57 varieties of rocks on sight. The generalist-geologist is in the same category as the prospector and the dodo.

In the second place, the Women's Bureau is smarter than our politicians and the general public. It may even be smarter than some of the so-called captains of the mineral industry. One West Coast mining firm, for example, recently appointed a law school graduate Vice President in Charge of Mining Operations.

At every turn it becomes more evident that we have forgotten the significance of our mineral heritage. Perhaps there is a mission the surplus manpower in the earth science field can perform. Call it public relations if you must, but it can best be done through teaching. And there is a shortage of teachers, especially at the high school level. True, few high schools offer courses in geology, but any geologist, properly trained, can teach general science, or chemistry, or physics, or biology. Instruction in any of these fields will benefit from examples and other background material drawn from the earth sciences.

## LETTERS *(Continued from page 35)*

bility. Errors of ommission are to save your eyesight and my headache. Least is also lesser to defend and cheapest to print. Key chapters from the text are omitted to conform with our spending philosophy.

If there is still anything left in my papers that makes sense to you, for heaven's sake cross it out. It shouldn't be there anyway.

Until I get some Word Casualty Insurance from the Lloyds of London, do not bring to my attention a word that cannot be accommodated in one of the categories listed above. I could not pay you off anyway!

IRUPSH

DEAR MR. HUNT:

Your method of dating mining camps (GeoTimes, May-June 1959) seems to have application in dating high strand lines resulting from hurricanes. In a recent field trip along the Texas coast, Dr. W. Armstrong Price, a Mr. Huntly and myself collected some old bottles associated with stand above sea level indicating that they could have been deposited by a 1916 hurricane or by a 1930 hurricane. Three bottles found unbroken had seams running up the sides and neck indicating post worldwar, according to your article. One bottle neck (A) in attached sketch had the seams on neck 90 degrees from seam on bottle. Do you have any idea as to the date this was made? Any comments on dates of (B), (C), and (D) would also be of interest to us.

Listerine bottles are common in strand line accumulations. Did you find these in camp middens? If so do you know when corks were replaced with caps? A listerine bottle was picked up in this particular site (cork type). The seam stopped at the base of the neck but another seam continued somewhat offset from the bottle seam and ended at the base of the lip (E).

I certainly enjoyed your article and thought you would be interested in its application elsewhere.

Sincerely yours,
LOUIS S. KORNICKER
Institute of Marine Science
University of Texas

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This might be a very useful way of sitting out the current employment situation —even at the sacrifice of qualifying for certification.

## SYMPOSIUM ON HIGHWAY GEOLOGY IN FLORIDA

**a report by**
**Phyllis H. Corchary**

The Eleventh Annual Highway Geology Symposium was held February 26 at the Florida State University in Tallahassee with the Florida Geological Survey and the Florida Road Department cooperating as hosts. Mr. W. T. Parrott, Highway Geologist, Virginia Department of Highways, presided at the meeting. Eight papers were given illustrating the applications of geology to highway engineering.

Dr. R. O. Vernon, Director of the Florida Geological Survey, discussed the distribution of base-course material and aggregate in Florida, and Mr. Bryant Mather, Chief, Special Investigations Branch, Concrete Division, U. S. Army Engineers, Waterways Experiment Station, Vicksburg, Mississippi, presented some of the problems of determining the suitability of a rock for concrete aggregate. A film of the AASHO experimental road in Ottawa, Illinois, was presented by Mr. W. N. Carey, Jr., Chief Engineer for Research, AASHO Road Test, Highway Research Board, Ottawa, Illinois. All phases of construction, instrumentation, and testing of the experimental road were shown.

Mr. P. Z. Michener, Engineer with Sverdrup and Parcel, Consulting Engineers, St. Louis, showed a film of the engineering research conducted prior to the selection of the site for the tunnel-bridge crossing of Chesapeake Bay near Norfolk. Mr. Axel M. Fritz, Sales Manager of Geophysical Specialties Company, Hopkins, Minnesota, illustrated the uses of his company's engineering seismograph in estimating soil thickness, depth to bedrock, relative hardness of bedrock, volume of borrow material, and excavation required in highway construction. A film showing beach erosion in Florida and the means of controlling erosion used in Florida and other parts of the world was presented by Dr. Per Bruun, Director of Technical Services, Coastal Engineering Laboratory, University of Florida.

Pavement disruption and subsidence due to oil and water pumping in Texas was the subject of a film shown by Mr. S. A. Lynch, Head of the Geology and Geophysical Department, Agricultural and Mechanical College of Texas. Mr. Henry A. Radsikowski, Chief, Division of Development and Research, Bureau of Public Roads, Washington, D. C., discussed the increasing use of geological and geophysical instruments in highway construction.

As a result of widespread interest, the Steering Committee decided in 1959 that the scope of the Symposia should be nationwide rather than be limited to the southeastern States. The Tallahassee meeting was the first meeting under the auspices of a National Steering Committee.

The Twelfth Annual Highway Geology Symposium will be held in February 1961 in Knoxville, Tennessee, under the sponsorship of the Departments of Geology and Civil Engineering of the University of Tennessee, the Tennessee Department of Highways, the Geologic Division of the Tennessee Valley Authority, the Division of Geology of the Tennessee Department of Conservation, and the U. S. Geological Survey. Information about publications of the Highway Geology Symposium may be obtained from the *Secretary*, Mr. H. D. Chase, Georgia State Highway Department, Atlanta, Georgia, and information about the Symposium from the *Chairman, Mr. W. T. Parrott, Highway Geologist, Virginia Department of Highways, Richmond, Virginia.*

## ROCK CHIPS

**by SANDSTONE SAM**

*Gophol*

*"How deep is this oil well of yours?"*
*"Twenty thousand miles."*
*"No machinery will drill a well that deep."*
*"Who said anything about machinery?"*
*"If you don't use machinery, how can you drill a well 20,000 miles deep?"*
*"Small gopher, big whip."*
*(courtesy Rocky Mtn. Geologist)*

• • •

*Brackiopods are of moraine origin—a student said so.*

• • •

*Another said—*
*There is no evidence that the area has been vulcanized.*

• • •

*Little public attention has been drawn to the inventive genius of the geologists—probably because what they mostly invent are just so many new terms (words, to you).*

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**Public Education is geology's best public relations tool**

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| On orders before April 20 | $4.75 |
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**Orders for these publications should be sent, with remittance, to**

**The Geological Society of America**
**419 West 117 Street**
**New York 27, N. Y.**


MINERALS OF NEW MEXICO, *Revised Edition, by Stuart A. Northrop, 665 pp., 1959, University of New Mexico Press, Albuquerque, N. M., $10.00.*

Primarily this book lists the descriptions and records of occurrence of minerals known to occur in New Mexico. The first 93 pages, however, presents historical data on the mineralogy of and mines in New Mexico. The book includes an exhaustive bibliography.

TECHNOLOGY IN AMERICAN WATER DEVELOPMENT *by Edward A. Ackerman and George O. G. Lof, 710 pp., John Hopkins Press, Baltimore, Md. $12.00.*

The authors, describing their book as an "exploratory study," trace the relation of technology to past and present water developments and water policy decisions in the United States. This background is followed by a comprehensive discussion of improved and new technological methods of developing, using, and conserving water resources. The economic and administrative aspects of the entire field of water and technology complete this rather lengthy volume.

This illustrated book is far more than a review of technology related to water. It will serve as a comprehensive and current reference work for those concerned with the general field of water resources. Included is a detailed index, list of general references, and a short glossary. Prepared for Resources for the Future, Inc.

J. B. G.

PRINCIPLES OF MINERALOGY, *by William H. Denne, 429 pp., 1959, Ronald Press, 15 E. 26th St., New York 10, N. Y. $7.50.*

An introductory college text which is divided into two major sections: I. General Principles and II. Mineral Descriptions. The book will be useful in courses where the introduction to mineralogy is taught to students who have not yet acquired adequate background in mathematics, physics and chemistry to tackle more advanced crystallography, physical chemistry and thermodynamics.

HYDROLOGY, *2nd Edition, by C. O. Wisler and E. F. Brater, 408 pp., 1959, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $9.25.*

A revised edition of the introductory text on hydrology which first appeared in 1949. Added are two new chapters on "Semiarid Regions" and "Snow."

DICTIONARY OF ATOMIC TERMINOLOGY *by Lore Lettenmeyer, 298 pp., 1959, Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. $6.00.*

Gives selected English scientific and technical terms with German, French and Italian equivalents.

GENERAL CRYSTALLOGRAPHY, *by W. F. de Jong, 281 pp., 1959, W. F. Freeman & Co., 66 Market St., San Francisco 4, Calif. $6.00.*

This is an English translation of Professor de Jong's (Univ. Delft) 1951 compendium published in Dutch. The translation has undergone some revision and expansion. The book presents a summary of modern crystallography.

OIL PROPERTY EVALUATION, *by John M. Campbell, 523 pp., 1959, Prentice-Hall Inc., Englewood Cliffs, N. J. $12.00.*

On the whole this book is well written from an academic viewpoint and should prove useful to the geologist with an engineering background, as well as petroleum engineers.

There has been a dire need for a book of this type for many years.

INDUSTRIAL MINERALS AND ROCKS, *Third Edition, Joseph L. Gillson, Editor-in-Chief, 934 pp., 1960, Seeley Mudd Series, AIME, 29 West 39th St., New York 18, N. Y. $12.00.*

This classic reference book on industrial minerals, which is completely revised and contains much new scientific and technologic data, reflects the rapidly expanding importance of the industrial minerals since the second edition was issued in 1949. The volume contains 56 chapters organized on a commodity basis compiled by more than 60 authors. Each chapter discusses briefly the occurrence, distribution, production, end-use specifications and markets. A selected bibliography on each commodity serves as a guide to the reader seeking more details. This volume is an essential volume on the reference book shelf of every geologist interested in mineral deposits.

THE SURVIVAL BOOK *by Paul H. Nesbitt, Alonzo W. Pond, and William H. Allen, 338 pp., 1959, D. Van Nostrand Co., Inc., Princeton, N. J. $7.50.*

By the very nature of his work the geologist may suddenly be thrown into an emergency situation. A plane crash, a vehicle failure, or a lost canoe can mark the beginning of a course of events for which few are ever fully prepared. This book may make the difference between comfort and discomfort or between success and failure.

Books on survival—like ready made suits

—can never be tailored to fit every situation. They have to be factual without being encyclopedic. This work is well written and easily readable.

The book first describes survival stresses and emergency procedures. This section is designed to give confidence to a survivor.

The last section of the book describes each of the geographic environments—arctic, desert, rain forest, savanna and sea—that present special survival problems. Survival considerations for each are given.

According to the authors, every geologist has the basic tool of survival, a mirror for signalling (the mirror and compass in the Brunton makes a lifesaving combination). The only other requirements are ingenuity (prompted by a book like this) and the will to live.

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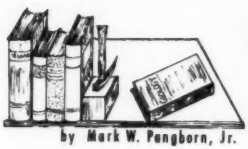
**HELICOPTER** *(Continued from page 14)*

flying weather was ideal—sunny and no wind. During the second half we experienced much bad weather—clouds, rain, and wind. The highest part of the mountain could not be mapped on account of snow—a hazard not expected at the particular season and not provided for in the contract. The wind and rain delayed the project by holding the ship on the ground, but otherwise did not interfere with the mapping. By being grounded 3 days for weather the project dragged out 11 days instead of being completed in 7 or 8.

### Equipment Safety Stressed

Not being acquainted with the aircraft business I was impressed by the care with which the ship was inspected, lubricated, and otherwise serviced. There was an inspection every time the ship landed, and a thorough one every evening by a mechanic who was able to locate defects that had not appeared during the flying. Any defect was corrected before the ship was allowed back in the air. One reason for the high hourly cost is the need for having a mobile unit with trained ground crew capable of making any kind of repair that the ship might require.

On the personal side, I had been apprehensive about my reactions to soaring around the heads of narrow canyons. But a helicopter rides more smoothly than a light plane. Because it travels slowly, sharp turns are not disturbing. I confess that despite numerous landings I never did quite adjust to the practice the helicopter has of lifting off the ridge top and then literally jumping out over the canyon bottom. My instincts, frankly, continue to be otherwise. I did learn too that one doesn't get in and ride a helicopter; it is put on and worn!



## Popular Geology in print

by Mark W. Pengborn, Jr.

Among the many new books on geophysics is *Sidney Chapman's* IGY: Year of Discovery (U. of Michigan Press, 1959, $4.95), an authoritative survey of the problems being investigated by the IGY: earthquakes, glaciers, oceans, the atmosphere, the aurora, geomagnetism, and cosmic rays; richly illustrated, but rather dry in comparison with, say, Ronald Fraser's exciting "Once round the sun." Likewise suitable for high school student and layman is Planet Earth (U. of Michigan Press, 1959, $5, paper $1.95), by German astronomer *Karl Stumpff*, who readably explains the earth's shape, rotation, the tides, moon, solar radiation, geomagnetism, the earth's structure and atmosphere; adequately illustrated, but no bibliography.

*Richard K. Burkhard's* timely Geodesy for the Layman (U.S. Air Force, Aeronautical Chart and Information Center, 2nd and Arsenal Sts., St. Louis 18, Mo., 1959, free) is a first and successful popular treatment of geodesy. Burkhard sketches the history of his science, depicts the figure of the earth, summarizes the principles of geodetic surveying and describes the development of a world geodetic system, so important in rocketry; abundantly illustrated.

We are glad to see that *George Gamow's* best-selling Biography of the Earth (Viking, 1959, $1.35) is now available in a revised edition; this vivdly written book stresses the earth's physical history, rather than the evolution of life; good pictures, but no bibliography.

Fine for ages 10 to 14 is All About the Ice Age (Random House, 1959, $1.95), *Patricia Lauber's* account of Pleistocene glaciation and its causes. The contributions of Agassiz, Libby, Maurice Ewing and the IGY are considered, as are the rôles of sunspots, volcanic dust, and shifting poles in changing the earth's climate; illustrations adequate.

The San Francisco earthquake of 1906 is the subject of *William Bronson's* The Earth Shook, the Sky Burned (Doubleday, 1959, $5.95), a marvelous picture book with accompanying text; although the fire naturally gets a big play, there are scores of revealing photos of quake damage and a chapter on the mechanics of the temblor. Inferior in every way is The

# GRAVIMETRIC CONVERSION FACTORS

AGI 18a FOLD

and other data used in interpreting analyses of rocks, minerals and waters

Based on atomic weights accepted by International Union of Pure and Applied Chemistry, 1957, and data in Handbook of Chemistry, 9th ed., edited by N. A. Lange and G. M. Forker, 1956.

Compiled by
Rollin E. Stevens, Sarah T. Neil, and Charles E. Roberson
U. S. Geological Survey

## DEFINITIONS AND USES

### EQUIVALENT WEIGHTS

1. Definition: The weight of an element or compound, in grams or other weight unites, equal in combining capacity to 8.0000 units of oxygen measured in the same weight unit. The equivalent weight of an element is calculated by dividing the atomic weight by the valence of the element; the equivalent weight of a compound is calculated by dividing the molecular weight of the compound by the positive or the negative valences expressed in the formula. For oxidation-reduction reactions, the molecular weight of the compound is divided by the change in valence of the oxidizable or reducible component in the formula to calculate the equivalent weight.

2. Uses: For water analyses, each constituent reported is divided by the corresponding equivalent weight to calculate the comparative combining capacity of each constituent in the analysis; if the analysis is reported in parts per million, equivalents per million parts of water will be obtained, from which the normality (equivalents per liter) of each constituent can be calculated (1).

For mineral analyses, the equivalent weights can be used to calculate from the analysis the atomic ratios in the formula of the mineral, particularly where ion substitutions involve valence changes or empty spaces within the atomic arrangement of the mineral, by adjusting the equivalents of cations (metallic or positive ions) in the analysis to balance the equivalents of anions in the formula (3).

### GRAVIMETRIC FACTORS

1. Definition: The factor by which a reported constituent is multiplied to express the constituent in another form or as a chemically equivalent quantity of another constituent.

2. Example of use: The content of $Al_2O_3$ in the analysis is multiplied by the appropriate factor (0.5292) to calculate the content of Al in the analysis, the content of F is multiplied by 0.421) to calculate the oxygen to which it is chemically equivalent; the content of FeO is multiplied by 0.7773 to express the content as Fe, by 1.6125 to express as $FeCO_3$, by 3.223 to calculate the magnetite ($Fe_3O_4$) corresponding to the content of FeO reported, by 1.0742 to calculate the $Fe_2O_3$ that would be formed by oxidation of the FeO, by 1.1113 to calculate the $Fe_2O_3$ that would be formed by oxidation, and by 1.4182 to calculate the fayalite ($Fe_2SiO_4$)corresponding to the content of FeO reported.

For minerals the factors refer to the idealize compositions given in the formulas. Isomorphous replacements of ions in the formulas make the factors only approximate in calculating the mineralogical content of rocks. The gravimetric factors may also be used in calculating mineral analyses to end-members represented by the idealized compositions expressed in the formulas.

### SIGNIFICANT FIGURES

Most factors are expressed only to four or five significant figures. This is because the atomic weights of many elements are known to only four significant figures. For example, the atomic weight of iron is given as 55.85, which implies an accuracy of about 1 part in 6,000. Therefore, to express the gravimetric factor for converting Fe to FeO as 1.2864816 rather than 1.2865 has little justification. Where the factor begins with a small number, as in 1.2865, five significant figures are given to make them correspond with high values in the next lower order of magnitude, for example, 0.9999.

Similarly, in using the factors, values obtained by computation should not be expressed in more than four or five significant figures.

For further discussion of significant figures, see Hillebrand and Lundell (2).

| Constituent reported | Formula or atomic weight | Weight of one equivalent | Constituent sought | Gravimetric factor |
|---|---|---|---|---|
| Ag | 107.88 | 107.88 | AgCl | 1.3287 |
| | | | $Ag_2O$ | 1.0742 |
| AgCl | 143.337 | 143.337 | Ag | .75263 |
| | | | $Ag_2O$ | .86844 |
| $Ag_2O$ | 231.76 | 115.88 | Ag | .93096 |
| | | | AgCl | 1.2369 |
| Al | 26.98 | 8.99 | $Al_2O_3$ | 1.8895 |
| $Al_2O_3$ (corundum) | 101.96 | 16.993 | Al | .5292 |
| | | | $Al(OH)_3$ (gibbsite) | 1.5301 |
| | | | $CaAl_2Si_2O_8$ (anorthite) | 2.729 |
| | | | $KAlSi_2O_8$ (orthoclase) (microcline) | 5.460 |
| | | | $KAl_3Si_3O_{10}(OH)_2$ (muscovite) | 2.604 |
| | | | $KAlSi_2O_6$ (leucite) | 4.281 |
| | | | $KMg_3AlSi_3O_{10}(OH)_2$ (phlogopite) biotite (3) | 8.186 / 4.10 |
| | | | $NaAlSiO_4$ (nepheline) | 2.787 |
| | | | augite (3) | 13.5 |
| | | | hornblende (3) | 9.52 |
| | | | $NaAlSi_3O_8$ (albite) | 5.144 |
| As | 74.91 | (3+) 24.97 | $As_2O_3$ | 1.3204 |
| | | | $As_2S_3$ | 1.6421 |
| | | (5+) 14.982 | $As_2O_5$ | 1.5340 |
| | | | $AsO_4$ | 1.8544 |
| $As_2O_3$ | 197.82 | 32.97 | $As_2S_5$ | 2.0702 |
| | | | As | .7574 |
| | | | $AsO_4$ | 1.4044 |
| | | | $As_2S_3$ | 1.2436 |
| $As_2O_5$ | 229.82 | 22.982 | As | .6519 |
| | | | $AsO_4$ | 1.2089 |
| | | | $As_2S_5$ | 1.3495 |
| | | | $B_2O_3$ | 3.219 |
| B | 10.82 | 3.607 | B | .27 |
| $B_2O_3$ | 69.64 | 11.61 | $Na_2B_4O_7 \cdot 10H_2O$ (borax) | .19 |
| Ba | 137.36 | 68.68 | BaO | 1.1165 |
| | | | $BaCO_3$ (witherite) | 1.4369 |
| | | | $BaSO_4$ (barite) | 1.6994 |
| BaO | 153.36 | 76.68 | Ba | .8957 |
| | | | $BaCO_3$ (witherite) | 1.2870 |
| | | | $BaSO_4$ | 1.5221 |
| Be | 9.013 | 4.507 | BeO | 2.7752 |
| BeO | 25.013 | 12.507 | Be | .3603 |
| | | | $Be_3Al_2Si_6O_{18}$ (beryl) | 7.163 |
| Bi | 209.00 | 69.67 | $Bi_2O_3$ | 1.1148 |
| | | | $Bi_2S_3$ | 1.2301 |
| $Bi_2O_3$ | 466.00 | 77.67 | Bi | .8970 |
| | | | $Bi_2S_3$ | 1.1034 |
| Br | 79.916 | 79.916 | O (equivalence) | .10010 |
| C | 12.011 | 3.003 | $CO_2$ | 3.6642 |
| | | | $CO_3$ | 4.9963 |
| $CO_2$ | 44.011 | 11.003 | C | .27291 |
| | | | $CO_3$ | 1.3635 |
| | | | $HCO_3$ | 1.3864 |
| | | | $BaCO_3$ (witherite) | 4.485 |
| | | | $CaCO_3$ (calcite) | 2.274 |
| | | | $CaMg(CO_3)_2$ (dolomite) | 2.095 |
| | | | $MgCO_3$ (magnesite) | 1.916 |
| $CO_3$ | 60.011 | 30.006 | $CO_2$ | .73338 |
| $HCO_3$ | 61.019 | 61.019 | $CO_2$ | .72136 |

## REFERENCES

1. Hem, John D., U. S. Geol. Survey Water Supply Paper 1473, p. 32 (1959).
2. Hillebrand, W. F., Lundell, G. E. F., Bright, H. A., and Hoffman, J. I., "Applied Inorganic Analysis", p. 8, John Wiley and Sons, New York, 1953.
3. Johannsen, Albert, "A Descriptive Petrography of the Igneous Rocks", 2d ed., V. 1, p. 292, University of Chicago Press, 1939.
4. Stevens, Rollin E., U. S. Geol. Survey Bull. 950 (1946).

DAMNDEST FINEST RUINS, by *Monica Sutherland* (Coward-McCann, 1959, $3.50), a rather childish account of the same disaster.

Latest in the fine "Science study series" is *Patrick M. Hurley's* HOW OLD IS THE EARTH? (Doubleday, 1959, $.95), a popular, meaty summary of current opinion on the earth's age and beginnings, with emphasis on the techniques of age measurement; pictures satisfactory, but a bob-tailed bibliography. Another good title for scientist or scholarly layman is THE AGE OF THE WORLD, FROM MOSES TO DARWIN (Johns Hopkins Press, 1959, $5), by historian *Francis C. Haber*, which traces the changes in our concept of the earth's age from Biblical times up through da Vinci, Descartes, Buffon and other philosophers, to the mid-nineteenth century, with its views of an evolved world of indefinite antiquity; copious footnotes.

**Answer to Geologic Quiz**

**Northeastern North Dakota from the Geological Society of America's "Glacial Map of the United States East of the Rocky Mountains".**

| Constituent reported | Formula or atomic weight | Weight of one equivalent | Constituent sought | Gravemetric factor | Constituent reported | Formula or atomic weight | Weight of one equivalent | Constituent sought | Gravimetric factor |
|---|---|---|---|---|---|---|---|---|---|
| Ca | 40.08 | 20.04 | $CaCl_2$ | 2.769 | $Fe_3O_4$ (magnetite) | 231.55 | | Fe | .7236 |
| | | | $CaCO_3$ (calcite) | 2.497 | | | | FeO (content) | .3103 |
| | | | $Ca(HCO_3)_2$ | 4.045 | | | | FeO (by reduction) | .9309 |
| | | | CaO | 1.3992 | | | | $Fe_2O_3$ (content) | .6897 |
| | | | $CaSO_4$ (anhydrite) | 3.397 | | | | $Fe_2O_3$ (by oxidation) | 1.0346 |
| $CaCl_2$ | 110.99 | 55.50 | Ca | .3611 | | | | Fe | .6994 |
| | | | Cl | .6389 | $Fe_2O_3$ (hematite) | 159.70 | 26.62 | | |
| $CaCO_3$ | 100.09 | 50.05 | Ca | .4004 | | | | FeO (by reduction) | .8998 |
| $CaF_2$ | 78.08 | | Ca | .5133 | | | | $Fe_3O_4$ (by reduction) | .9666 |
| | | | CaO | .7182 | | | | augite (3) | 21.7 |
| | | | F | .4867 | | | | hornblende (3) | 6.14 |
| $Ca(HCO_3)_2$ | 162.12 | 81.06 | Ca | .2472 | | | | Fe | .4655 |
| | | | $HCO_3$ | .7528 | $FeS_2$ (pyrite) | 119.98 | | | |
| CaO | 56.08 | 28.04 | Ca | .7147 | | | | FeO (by reaction) | .9989 |
| | | | $CaAl_2Si_2O_8$ (anorthite) | 4.961 | | | | $Fe_2O_3$ (by reaction) | .6655 |
| | | | $CaCO_3$ (calcite) | 1.785 | | | | S | .5345 |
| | | | $CaMg(CO_3)_2$ (dolomite) | 3.289 | | | | $SO_2$ (by reaction) | 1.0679 |
| | | | $CaMgSi_2O_6$ approx. (diopside) | 3.862 | Ga | 69.72 | 23.24 | $Ga_2O_3$ | 1.3442 |
| | | | | | $Ga_2O_3$ | 187.44 | 31.24 | Ga | .7439 |
| | | | augite (3) | 4.79 | Ge | 72.60 | 18.15 | $GeO_2$ | 1.4408 |
| | | | hornblende (3) | 17.2 | $GeO_2$ | 104.60 | 26.15 | Ge | .6941 |
| | | | $Ca_5(PO_4)_3F$, var. (apatite) | 1.7992 | H | 1.0080 | 1.0080 | $H_2O$ | 8.9365 |
| | | | | | $H_2O$ | 18.016 | 9.008 | H | .1190 |
| | | | $CaSiO_3$ (wollastonite) | 2.072 | | | | O | .8881 |
| | | | | | | | | OH | 1.8881 |
| | | | $CaSO_4$ (anhydrite) | 2.428 | $H_2S$ | 34.082 | 17.041 | S | .9408S |
| | | | | | Hf | 178.50 | 44.63 | $HfO_2$ | 1.1793 |
| | | | $CaSO_4 \cdot 2H_2O$ (gypsum) | 3.070 | $HfO_2$ | 210.50 | 52.63 | Hf | .8480 |
| | | | | | Hg | 200.61 | (1+) 200.61 | HgCl | 1.1767 |
| | | | | | | | | $Hg_2O$ | 1.0399 |
| | | | | | | | | $Hg_2S$ | 1.0799 |
| $CaSO_4$ | 136.15 | 68.07 | Ca | .2944 | | | (2+) 100.31 | $HgCl_2$ | 1.3515 |
| | | | CaO | .4119 | | | | HgO | 1.0798 |
| | | | $SO_3$ | .5881 | | | | HgS | 1.1599 |
| | | | $SO_4$ | .7056 | I | 126.91 | 126.91 | O (equivalence) | .06304 |
| $CaSO_4 \cdot 2H_2O$ (gypsum) | 172.18 | | CaO | .3257 | In | 114.82 | 38.27 | $In_2O_3$ | 1.2090 |
| | | | | | K | 39.100 | 39.100 | KCl | 1.9068 |
| | | | $CaSO_4$ (anhydrite) | .7907 | | | | (sylvite) | |
| | | | | | | | | $K_2CO_3$ | 1.7674 |
| | | | | | | | | $KHCO_3$ | 2.5606 |
| | | | | | | | | $K_2O$ | 1.2046 |
| Cb (see Nb) | | | | | | | | K | .52443 |
| Cd | 112.41 | 56.21 | CdO | 1.1423 | | | | | |
| | | | CdS | 1.2853 | KCl (sylvite) | 74.557 | 74.557 | Cl | .47557 |
| CdO | 128.41 | 64.21 | Cd | .8754 | | | | $K_2O$ | .63173 |
| | | | CdS | 1.1251 | | | | K | .38671 |
| Ce | 140.13 | (3+) 46.71 | $Ce_2O_3$ | 1.1713 | $KNO_3$ (niter) | 101.11 | 101.11 | | |
| | | (4+) 35.03 | $CeO_2$ | 1.2284 | | | | $K_2O$ | .46583 |
| $Ce_2O_3$ | 328.26 | 54.71 | Ce | .8538 | | | | $NO_3$ | .61327 |
| $CeO_2$ | 172.13 | 43.03 | Ce | .8141 | | | | K | .83015 |
| Cl | 35.457 | 34.457 | CaCl | 1.5651 | | | | KCl | 1.5830 |
| | | | KCl | 2.1027 | $K_2O$ | 94.20 | 47.10 | $KAlSi_3O_8$ | 5.910 |
| | | | $MgCl_2$ | 1.3430 | | | | (orthoclase, microcline) | |
| | | | NaCl | 1.6484 | | | | | |
| | | | O (equivalence) | .22563 | | | | $KAl_2Si_3O_{10}(OH)_2$ (muscovite) | 8.457 |
| Co | 58.94 | 29.47 | CoO | 1.2715 | | | | | |
| CoO | 74.94 | 37.47 | Co | .7865 | | | | $KMg_3AlSi_3O_{10}(OH)_2$ (phlogopite) | 8.860 |
| Cr | 52.01 | 17.34 | $Cr_2O_3$ | 1.4614 | | | | | |
| $Cr_2O_3$ | 152.02 | 25.34 | Cr | .6843 | | | | $KAlSi_2O_6$ (leucite) | 4.634 |
| Cs | 132.91 | 132.91 | $Cs_2O$ | 1.0602 | | | | | |
| $Cs_2O$ | 281.82 | 140.91 | Cs | .9432 | | | | biotite (3) | 8.93 |
| Cu | 63.54 | (1+) 63.54 | $Cu_2O$ | 1.1259 | | | | | |
| | | | $Cu_2S$ | 1.2523 | | | | | |
| | | (2+) 31.77 | CuO | 1.2518 | La | 138.92 | 46.31 | $La_2O_3$ | 1.1728 |
| | | | CuS | 1.5047 | $La_2O_3$ | 325.84 | 54.31 | La | .8527 |
| $Cu_2O$ | 143.08 | 71.54 | Cu | .8882 | Li | 6.940 | 6.940 | $Li_2O$ | 2.153 |
| | | | $Cu_2S$ | 1.1123 | $Li_2O$ | 29.88 | 14.94 | Li | .4645 |
| CuO | 79.54 | 39.77 | Cu | .7988 | | | | $LiAlSi_2O_6$ (spodumene) | 12.456 |
| | | | CuS | 1.2020 | | | | | |
| F | 19.00 | 19.00 | $CaF_2$ (fluorite) | 2.055 | Mg | 24.32 | 12.16 | $MgCl_2$ | 3.916 |
| | | | O (equivalence) | .4211 | | | | $MgCO_3$ | 3.467 |
| Fe | 55.85 | (2+) 27.93 | FeO | 1.2865 | | | | $Mg(HCO_3)_2$ | 6.018 |
| | | | $Fe_3O_4$ | 1.3820 | $MgCl_2$ | 95.23 | 47.62 | MgO | 1.6579 |
| | | (3+) 18.62 | $Fe_2O_3$ | 1.4297 | | | | Mg | .25538 |
| FeO | 71.85 | 35.93 | Fe | .7773 | $MgCO_3$ (magnesite) | 84.33 | 42.17 | Cl | .7446 |
| | | | FeCO | 1.6125 | | | | Mg | .2884 |
| | | | $Fe_3O_4$(magnetite) | 3.223 | | | | | |
| | | | $Fe_3O_4$(by oxidation) | 1.0742 | $Mg(HCO_3)_2$ | 146.36 | 73.18 | MgO | .4781 |
| | | | $Fe_2O_3$(by oxidation) | 1.1113 | | | | Mg | .16662 |
| | | | $Fe_2SiO_4$ (fayalite) | 1.4182 | MgO | 40.32 | 20.16 | $HCO_3$ | .8338 |
| | | | | | | | | Mg | .6032 |
| | | | $FeSiO_3$ (ferrosilite) | 1.8363 | | | | $CaMgSi_2O_6$ (diopside) | 5.372 |
| | | | $FeTiO_3$ (ilmenite) | 2.1120 | | | | $MgCO_3$ (magnesite) | .20915 |
| | | | augite (3) | 14.5 | | | | $Mg(OH)_2$ (brucite) | 1.4469 |
| | | | hornblende (3) | 4.52 | | | | $KMg_3AlSi_3O_{10}(OH)_2$ (phlogopite) | 3.450 |
| | | | Hypersthene (3) | 3.24 | | | | | |
| | | | | | | | | augite (3) | 7.94 |
| | | | | | | | | hornblende (3) | 12.05 |
| | | | | | | | | forsterite (3) | 1.75 |
| | | | | | | | | enstatite (3) | 2.50 |
| | | | | | | | | hypersthene (3) | 5.78 |

(To be continued on AGI Data Sheet #18b)


BIG RISK. 16mm. Sound. Color. 21 minutes. 1959. Grand marimba music accompanies this story of the largest air lift in the history of the petroleum industry. Six million pounds of rotary and other equipment are moved into the Guatemalan jungle in the search for oil. This is a beautifully filmed travelogue type of picture which might be useful for classes in field or economic geology, to illustrate some of the problems encountered in wildcat exploration for oil in tropical jungles. DISTRIBUTOR: *Ohio Oil Co. Film Library, 539 S. Main St., Findlay, Ohio.* Also *Modern Talking Picture Service* in 29 cities.

FORCES. 16 mm. Sound. Black and White. 21 minutes. 1959. Reviews gravitational, magnetic, electrical and nuclear forces. The sequence showing the action of a torsion pendulum is perhaps the best available picture-demonstration of this apparatus. For elementary geology and geophysics classes. DISTRIBUTOR: *Educational Services Inc., Physical Science Study Committee, 164 Main St., Watertown 72, Mass.* Distributed on a subscription basis.

THE MATHEMATICIAN AND THE RIVER. 16 mm. Sound. Color. 18 minutes. 1959. The objective of this film—to show that mathematics can describe with precision the forces of nature controlling flow of water in a river—merits several hurrahs. But the result is below the standards of many of this group's new films. Some formulae accompany brief discussions of such variables as stream bed friction and shape, and changes in water levels, but too much of the film focusses on extraneous details. There are some excellent shots of the scale model of the Mississippi River built by the Army Corps of Engineers at Jackson, Mississippi. A moderately useful film to show that relationships exist between mathematics and geology. DISTRIBUTOR: *Educational Services Inc., Physical Science Study Committee, 164 Main St., Watertown 72, Mass.* Distributed on a subscription basis.

PROJECT MOHOLE—REPORT No. 1. 16 mm. Sound. Color. 18 minutes. 1959. Drilling an exploratory hole to the Mohorovicic discontinuity, which separates the crust and mantle, has been praised by many as imaginative research and damned by others as money down an excavation commonly associated with the genus *Rattus*. However, exploration of the ocean floor for a suitable site for such a hole began in 1959, when the *Vema*, research vessel of the Lamont Geological Observatory, helped survey an area north of Puerto Rico. Here is the story of that study—of seismic shooting, echo sounding and sediment coring in a region where the "Moho" may be only four miles or so beneath the surface instead of the usual 20 or 30 miles found beneath the continents. A well photographed account showing several aspects of oceanographic research. DISTRIBUTOR: *Horizons of Science, Educational Testing Service, 20 Nassau St., Princeton, New Jersey.* Distributed on a subscription basis.

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**GEOCHEMIST** *(Continued from page 30)*

leading to a written thesis might afford an area where this integration could be exercised. The desirability of familiarizing the student with the basic principles of both fields precludes the practicality of specialization at the M.S. level unless the period of study is further prolonged. Can a suitable geochemistry M.S. program be formulated so as not to require more time than a comparable degree in geology or chemistry?

The graduate student interested in geochemistry is likely to be plagued by difficulties arising from "unappreciative" overseers. Unless the school has an established curriculum for geochemistry this may be a serious hurdle. The professional chemist who wouldn't recognize plagioclase between crossed nicols and has never calculated a norm is no rarer than the geologist who considers free energy a property peculiar to certain experiments in the physical chemistry laboratory. The result may be a tug-of-war sort of affair which leaves the student with a program delineated by two defensive camps. Is it necessary that the geochemist be given a detailed mapping problem in geology or be required to spend long hours developing technique in the chemistry laboratory?

At the Ph.D. level the problem is magnified. In order to be qualified to direct geochemical research and/or teach geochemistry, the Ph.D. must be strong in both fields and possess a comprehensive grasp of the concepts which have led to the recognition of the term "geochemistry."

Should he be able to apply the basic fundamentals of thermodynamics to his treatment of natural phenomena? Should he be familiar with the theory of optical mineralogy and able to use the petrographic microscope as a tool? Should he be capable of explaining the composition of minerals

**GEOCHEMIST** *(Continued from page 43)*

by recourse to the limitations of Pauling's principles? Should he have had field experience in geology to afford him with an appreciation of the problems involved? Should he be familiar with the literature of geology and chemistry? Should he be conversant enough with organic chemistry to intelligently speculate on petroleum genesis? Would he recognize a hand specimen of a graywacke?

Surely any college or university hiring a Ph.D. as a geochemist would expect or at least desire a "yes" answer to these questions. What does the training of such a man involve? It is unlikely that he could be trained in any less than five full academic years beyond the B.S. degree, providing that his undergraduate training has given him a firm footing in both fields.

If we restrict the category of "geochemist" to those individuals who are adequately informed in both disciplines, and in addition, qualified to integrate their knowledge, it seems that a census taker need arm himself with but one dull pencil. *(P.S. There'll be no graphite wasted in this office.)*

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UNIVERSITY OF NEVADA, Reno. Opening September 1960 for Lecturer in Paleontology, general geology. One year appointment. Teaching load restricted to two courses per semester. Remainder of time collecting and curating fossils. For full details, apply to: E. R. Larson, Chairman, Department of Geology, Mackay School of Mines.

INSTRUCTOR to teach physical and historical geology, mineralogy, petrology, 12 hr. course load. Prefer young Ph.D. Write Chairman, Dept. Geology, Newark Colleges, Rutgers Univ., Newark 2, N. J.

WANTED. RESIDENT GEOLOGIST. Graduate degree in mining geology and minimum 7 years' experience in hard-rock mining geology at nonferrous, operating mining properties required. Opening in Chile with large North American company. Age 30-40, knowledge of Spanish not essential but desirable, salary commensurate with experience. Reply in full confidence with complete and detailed resume to Box 117.

GEOLOGIST, Ph.D. or equivalent, to teach general geology and paleontology for next academic year (1960-61) as substitute for staff member on sabbatical leave. Good northeastern university. Opportunity for research. Must be well recommended. Box 118.

WANTED. SEISMOLOGIST trained in theoretical wave propagation. Earthquake seismology and field record interpretation experience valuable. Must be U.S. citizen. Send resume of education and experience to: United Electrodynamics, Inc., 200 Allendale Road, Pasadena, California. MUrray 2-1134. Attention: B. J. Curtis.

GEOPHYSICIST. Recent graduate required for supervision of geophysical surveys and for laboratory studies in cooperation with exploration program in the U.S. and Canada. Some field experience and geological training desirable. Write to Research Department, The New Jersey Zinc Co. (of Pa.), Palmerton, Pa.

ASSISTANT PROFESSOR—to teach geochemistry and petrology. Opportunity for research. Ph.D. required. New York State. Box 119.

## POSITIONS WANTED

BOX 611. ASSISTANT PROFESSOR, Ph.D. major university wishes to teach in college or university in more desirable area. 3 yrs. teaching and 6 yrs. varied industrial experience. Primarily interested marine geology, paleontology, sedimentation, mineralogy. Active researcher, member prof. societies. Resume on request.

BOX 612. MUSICIAN and composer; full professor; major university; Yale graduate; 13 yrs. teaching experience; former violinist in internationally famous string quartet; Guggenheim Fellow; married; 2 children; wishes to teach in college or university in more desirable area; amateur geologist; would appreciate your bringing this ad to the attention of your Music Department. Resume on request.

BOX 640. PETROLOGIST, 38, Ph.D. '52.

BOX 646. GEOLOGIST, broad exploratory background in the Four Corners, Panhandle and West Texas. Eight years experience includes subsurface, administration and seismograph. Some field and well work. Desires more responsibility.

BOX 647. GEOLOGIST, Ph.D., 34, married. Desires permanent teaching position in small to moderate size school and town, preferably in south or west. Broad geological background in teaching and research, especially in sedimentary rocks, principles of stratigraphy, petroleum geology, and mineralogy. 2½ years experience with major oil company.

BOX 655. GEOLOGIST, Ph.D., 35, on sabbatical leave beginning February or June, 1960. Available for project work of any type, preferably foreign. Broad scientific background and diversified practical experience, especially within the mineral industry. Works well with people and enjoys all phases of the profession.

BOX 670. GEOLOGIST, M.S., Ph.D. work completed, 31, married, veteran, 4 yrs. experience stratigraphic mineral deposits, sedimentology. Desires petroleum work domestic or foreign.

BOX 671. GEOLOGIST, Ph.D., 37, married, 5 years industrial experience, 2 years teaching experience, desires teaching and/or research position. Primary interests: sedimentation, sedimentary petrography, petroleum geology, stratigraphy. Secondary interests: structure, field geology, economic geology.

BOX 676. PETROLEUM GEOLOGIST-Stratigrapher, 32, M.S., family, 6 yrs. varied exp. U.S., Canada and Foreign with major oil and consulting. Desire position of responsibility in research or exploration. Executive ability, presently chief geologist. Consider any reasonable offer.

BOX 681. GEOLOGIST, M.S., 39, family, 9 years teaching experience in eastern and midwestern universities. Several summers experience with state geological survey and consultant for private corporations. Chief interests sedimentation, mineralogy and petrology. Will consider either a teaching position or an industrial offer. Available end of summer.

BOX 689. PETROLOGIST-GEOCHEMIST, 32, Ph.D. Five years experience in major oil company research laboratory in fields of x-ray and spectrographic analysis, clay mineralogy and geochemistry of sediments. Broad graduate background in geology. Teaching experience in elementary geology, physics, and chemistry at small college. Desires position at college or university. Available in late August, 1960.

BOX 692. GEOLOGIST, Ph.D. expected 1960, 27, single. Desires teaching and research position in university in sedimentary petrology, stratigraphy and sedimentation commencing with the fall term in 1960. Special interests include sandstone petrology, sedimentary structures and paleocurrents. Geological experience includes 6 summers mapping and research in Canada and 1 year in midcontinent. Teaching experience of 3 years at elementary and senior course level.

GEOLOGICAL ENGINEER; Colo. School of Mines graduate, M.S. from Stanford, studying for Ph.D., 24, single, summer field position desired, available June 13-Sept. 22, 1960. Room 10419, Centennial Hall, U. of Minn., Minneapolis 14, Minnesota.

BOX 694. GEOLOGIST, Ph.D. Eastern University 1960—desires teaching position. Teaching experience: 3 years. Courses taught: physical and structural geology; mineralogy; petrology; economic geology; physiography of N. America. Able to teach any elementary geology course and advanced courses in crystallography, petrography and petrology. Field experience—Newfoundland and Maine.

BOX 695. GEOLOGIST - PALEONTOLOGIST, Ph.D., 30, desires teaching position with research opportunity. Background includes experience in several phases of micropaleontology, as well as stratigraphy, sedimentary petrology, and petrography. Prefer to teach courses in paleontology, stratigraphy, historical geology and related subjects.

BOX 696. MICROPALEONTOLOGIST-ZOOLOGIST, M.S. in zoology, M.S. in geology plus 25 sem. hrs., single. Two years foreign experience well-site and field, five years surveying, two years topo drafting. Interested in biostratigraphy, drafting, illustrating. Will travel. Resume and drawing samples on request.

BOX 698. SEDIMENTOLOGIST-GEOMORPHOLOGIST, Ph.D., 27, family. Desires teaching or research position at college or university. Interested in the application of statistics to geological problems. Currently studying on a postdoctoral fellowship in statistics at midwestern university. Available after June.

BOX 701. MICROPALEONTOLOGIST-STRATIGRAPHER, 15 years with a major in California, Venezuela, Cuba. Wants permanent teaching job in college or university, and work toward Ph.D.

BOX 702. MARINE GEOLOGIST-SEDIMENTOLOGIST, Ph.D., 31, family. Desires teaching position, some research. Experience with carbonate and detrital marine sediments, deltaic sedimenation, environmental analysis of sedimentary rocks; trained in marine geology, sedimentation, oceanography; 2½ years experience in research section of major oil company.

BOX 703. GEOLOGIST, Ph.D. (Minn.), 40, with a large and happy family. Eight seasons in varied polar work, mostly in the Canadian Arctic; four years University teaching in Introductory Geology, Geomorphology, Photogeology, Glacial and Pleistocene Geology; and four years University Extension teaching in Physical Geology, Mineralogy, Rock Study, and Glacial and

## POSITIONS WANTED—continued

Pleistocene Geology; am currently teaching. Member of various professional societies, Sigma Xi, and Phi Beta Kappa. Desire to teach in N. central, N.E., or S.W. U.S. Available in summer/fall, 1960.

BOX 706. GEOLOGIST-GEOPHYSICIST, 43, Ph.D. '59, extensive US and foreign geophysical experience in interpretation, field procedures, supervision, and reporting. Recent training in petrography, mineralogy, petrology, and photogeology. Good background in optical methods from lab teaching experience and thesis research. Interested in research in above fields, US and foreign, and in technical assistance type projects. Resume on request.

BOX 708. ENGINEERING GEOLOGIST, 31, M.S.E.G.; 7 yrs. in Eng. Geol., Geophysics, Hydrology. Presently responsible for Eng. Geol. Reports concerning materials and foundations of civil projects in flood control and water supply, and the inspection and control of private works.

BOX 709. GEOLOGIST, 27, married; Ph.D. (London), 1 year PostDoctoral Research Fellow, N.R.C. Canada; now in 3rd year Assistant Professor in Canadian university, teaching petrology, sedimentology, structural geology. Prime interest metamorphic geology, but would like to develop interest in geochemistry. Desires teaching and research position in September, 1960.

BOX 713. GEOMORPHOLOGIST-GLACIAL GEOLOGIST, Ph.D., 36, desires teaching position in midwestern or northeastern college with graduate program, or undergraduate program with research encouraged. In addition, can teach ground water and structural geology. Four years with Ground Water Branch, USGS, five years in teaching, publications. Resume on request.

BOX 715. PALEOECOLOGIST, M.A., 33, married, 3 years paleoecology-stratigraphy experience with major oil company. Two years college teaching, California teaching credential, publications. Desires teaching or research position.

BOX 716. PALEONTOLOGIST, Ph.D., 33, five years teaching experience. Specialties geochemistry and paleoecology but have taught courses in many other areas. Desires teaching position with opportunity for research starting September, 1960.

BOX 717. GEOLOGIST, B.A., M.A. Phi Beta Kappa, 27, married, 2½ years experience petroleum explor., currently employed. Wishes career in teaching at college offering studies toward a Ph.D.

BOX 718. GEOLOGIST, 33, M.S., married. 8 yrs. experience Engring. Geologist. Presently at Lamont Geological Obs. and Instr., Queens College. Seeks academic, research or commercial position.

BOX 719. ADVANCED GRADUATE STUDENT with Ph.D. thesis almost completed, currently Fulbright student in Austria, seeks position in teaching, research, or exploration. Major interests in the fields of petrography, particularly of metamorphic rocks, structure, and physiography. Broad academic background and interests. Available in September 1960 following the International Geological Congress.

BOX 720. GEOLOGIST, B.A., M.S., 27, vet., married, 3 yrs. experience with major oil company, now employed. Some teaching experience in elementary geology. Would like a teaching or research position in a university offering Ph.D. program. Main interest—stratigraphy, sedimentation.

BOX 721. MARINE GEOLOGIST - SEDIMENTOLOGIST. Ph.D. Chairman three-man department in northern U.S.A. Relocate in South, Southwest, or West. Teaching or research.

BOX 722. GEOPHYSICIST—M.S., Mining Engineer, equivalent Ph.D. level in geology, 25 years domestic and foreign experience in oil exploration with major oil companies, presently employed in Geophysical Research Group, seeks employment with broader scope. Speaks four languages, married, no children.

BOX 723. SEDIMENTOLOGIST - STRATIGRAPHER, 26, married, family; thorough background in mathematics, physics, chemistry; field and research experience in geology, physics, creative ability. Desires field-research position in area where family can accompany.

BOX 724. Ph.D. wishes to teach MINERALOGY, Economic Geology, Petrography, Spanish. Formerly Asst. professor at Northwestern and Lehigh Universities and Bryn Mawr College. Worked as Economic Geologist in Latin America for 42 years. Age 73. Excellent health.

BOX 725. GEOLOGIST-MINERAL ECONOMIST, Ph.D., experienced in mining geology of the Appalachian and Rocky Mt. ore deposits, 15 years experience in Company and Government projects. Desires position dealing with geologic and economic problems of mineral deposits exploitation.

BOX 726. GEOLOGIST, Ph.D. expected Aug. 1960. Single, 28, desires teaching position and opportunity for research with western school (preferably). Three years varied industrial experience, publications. Interests: physical, historical, petroleum, sedimentation, stratigraphy, field mapping, etc.

BOX 727. GEOLOGIST, 45, single, desires position as liaison geologist, sales representative, administrator, or special jobs. 15 years foreign oil experience; speak Spanish & Portuguese. Available on short notice; have passport.

BOX 728. GEOLOGIST M.S. (Geol.), 25, family, 1½ years varied experience in engineering geology and industrial mineral exploration. Presently employed. Desire position in western United States in mineral exploration or engineering geology. Available during 1960 upon reasonable notice.

BOX 729. STRATIGRAPHER-PALEONTOLOGIST, Ph.D., 34, married, 5 years teaching experience and 5 summer field seasons with major oil company and mining company in Rocky Mountain-Great Basin area. Presently assist. Professor in small western college but desires change to more progressive department or would consider exploration research position in industry. Member of professional societies. Resume on request.

INVERTEBRATE PALEONTOLOGIST, M.A., '59, 28, single. Would enjoy research, but will consider laboratory technician work. Have 6 months museum experience, 1 year, 3 months as research assistant. Anywhere in U.S., prefers Western U.S. Salary open. Resume on request. Miss Joan Echols, Box 185, R. R. 5, Austin 4, Texas.

BOX 730. PALEONTOLOGIST-STRATIGRAPHER. Desires permanent teaching position. 11 years teaching experience in paleontology, stratigraphy, sedimentology, historical geology. Publications. Available Sept. 1960.

BOX 731. PETROLEUM GEOLOGIST, married, age 28, B.S. degree, with four years experience in South America in operation and exploration phases of geology plus training in petroleum engineering desires position in the U.S. preferably in the Permian Basin.

BOX 732. MINING GEOLOGIST, Ph.D., 37, married, one child. 8 yrs. experience in mining, exploration, evaluation, mineral economics and some geophysics, in U.S. and Latin America. Desire responsible position in mining, U.S. or foreign. Presently employed. Excellent references. Resume on request.

BOX 733. GEOLOGIST, Ph.D. with broad teaching background desires teaching position or museum work. Principal fields taught: Petrology, mineralogy, structural geology, geomorphology, paleontology, economic geology. Can teach other geological fields and biology.

GEOLOGIST. Hons. B.Sc. London University specialized; structural, stratigraphy, petrology; seeks position in petroleum geology, U.S.A./Foreign. Experience; field mapping; electronic instrumentation. Married. No children. Ford, 103 Moonachie Ave., Moonachie, N. J.

BOX 734. GEOLOGIST, B.A., M.S., 24, married. Three summers experience in engineering geology with major engineering firm. Desires position in engineering, exploration, or mining geology.

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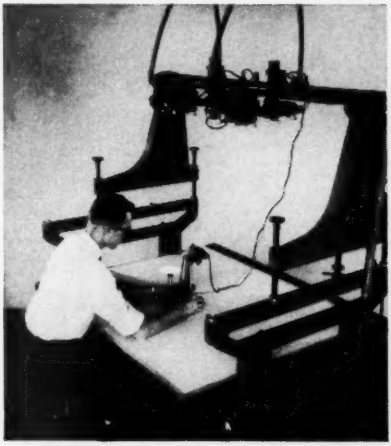

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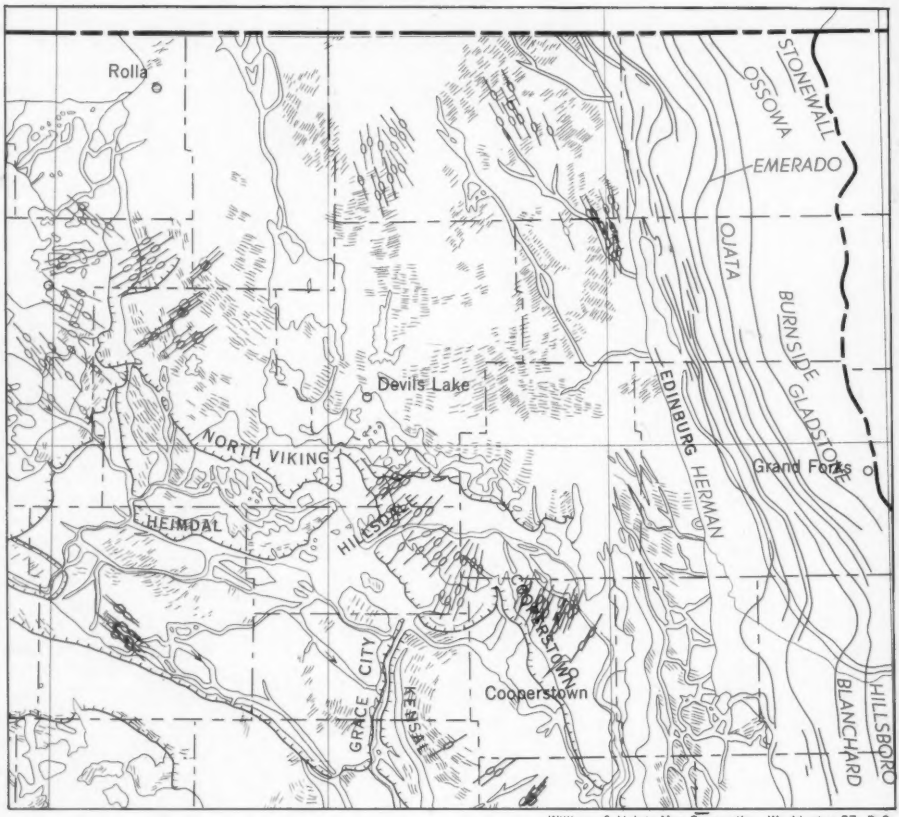


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2. *The area is somewhere west of the Mississippi*

If you give up the answer is on page 41

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